

**JOINT BUSINESS
STRAWMAN PROPOSAL**

**STATE HAZARDOUS AIR
POLLUTANTS RULEMAKING**

**Submitted to the
Arizona Department of Environmental Quality**

October 2005



October 20, 2005

Nancy C. Wrona
Director, Air Quality Division
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
1110 West Washington Street
Phoenix, AZ 85007

Re: Joint Business State HAP Proposal

The undersigned associations support the adoption of a State hazardous air pollutant (HAP) program that complies with the State HAP statutes enacted by the Legislature in the 1990s. Our proposal for such a program is attached for your serious consideration. Our proposal has similarities to, and differences with, the October 12, 2005 strawman HAP rule developed by the Arizona Department of Environmental Quality (ADEQ). Some of the main differences are summarized below:

Risks vs. Effects: The State HAP statutes require ADEQ to make scientific findings as a pre-condition to regulating some sources. For example, the HAP statutes speak of “adverse effects to human health,” not merely the *risk* of adverse effects or *potential* adverse effects. Likewise, the statutory criteria for listing a HAP source category include a finding that a sources in the category “result in” adverse effects, not merely *potentially* result in adverse effects. In several important respects, ADEQ’s proposal is based on risks, potential effects and assumptions, rather than on real-world effects, results and data, as required.

Ambient Air Boundary: ADEQ’s proposal is based on predicted air quality *within* private property, rather than at the private property fenceline. Specifically, ADEQ’s proposal is designed as if members of the public were exposed to HAP at a distance of 25 meters (82 ft) from an industrial emissions unit for 24 hours per day, 350 days per year, for 30 years. Since members of the public do not reside within industrial plants, and the air program does not regulate workplace conditions, this approach is orders of magnitude more stringent than warranted.

Screen Model Predictions: Screen models are so named because they are designed to overestimate the impact of emissions on air quality merely as an initial “screening” tool when studying *potential* air impacts. EPA and other agencies recognize that screen models should not be used to predict *actual* impacts. Nevertheless, ADEQ’s program uses a very conservative screen model to predict what types of sources will “result in” adverse effects. ADEQ’s modeling methodology overpredicts chronic public exposure by multiple orders of magnitude.

Adverse Effects to Human Health: ADEQ's program assumes that a one in a million cancer risk meets the statutory definition of "adverse effects to human health." In contrast, the statutory definition includes only those effects that "significantly contribute" to serious problems or are "known to be or may reasonably be anticipated to be caused." A one in a million risk represents an effect that is *highly unlikely* to occur. Moreover, according to EPA and other agencies, the acceptable range of risk is one in a million to one in ten thousand. ADEQ's approach is one or more orders of magnitude more stringent than warranted.

Worst-Case Surrogate for Chemical Groups: Most federal HAPs are named as individual chemicals. Some groups of federal HAPs, however, are described by a generic reference to a group of compounds (*e.g.*, "polycyclic organic matter" or "chromium compounds"). ADEQ's method for determining adverse effect levels assumes that the *worst* chemical in a group fairly represents *all* of the chemicals in the group. In reality, the toxicity of chemicals within a group can vary considerably—up to differences of several orders of magnitude, according to EPA. ADEQ's worst-case assumption does not meet the statutory criteria for identifying "adverse effects" or for finding that a source "results in" adverse effects.

Source Categories: The State HAP program applies to a small HAP source only if the source is in one of the categories for which the Director has made the scientific finding required by A.R.S. § 49-426.05 (*i.e.*, sources in the category "result in" adverse effects). ADEQ's proposal would regulate *all* sources within a source category based solely on ADEQ's evaluation of *one* source in that category. ADEQ's approach does not comply with the statute: "The director shall to the maximum extent practicable define source categories so that they cover only those sources for which the finding required by this subsection has been made." A.R.S. §49-426.05(A).

Cost Shifting: As illustrated above, ADEQ's program uses very conservative methods to identify (i) what level of a HAP allegedly causes an "adverse effect to human health" and (ii) what minor source categories allegedly have HAP emissions that "result in" adverse effects. As a result, ADEQ's proposal seeks to regulate based on remote risk or potential adverse effects—rather than on actual adverse effects as required by the HAP statute. ADEQ's approach would bring more sources into the State HAP program. ADEQ suggests this is not a hardship, because sources later can conduct their own studies to persuade ADEQ, on a case-by-case basis, that they should not be regulated. However, if ADEQ conducts a less robust study than the HAP statute requires as a pre-condition to regulation, ADEQ shifts its own HAP study costs to the business community.

Risk Management Analysis: The HAP statute places no restrictions on an applicant's options for making a Risk Management Analysis (RMA) to demonstrate that MACT or HAPRACT is not necessary to avoid adverse effects. ADEQ's "Tier 4" RMA requirements would place restrictions on options for determining the point of exposure and on the factors that may be considered in lieu of ADEQ's ultra conservative modeling assumptions and acceptable levels. ADEQ's approach is more restrictive than authorized by the HAP statute.

De Minimis Levels: For existing facilities, the HAP statute authorizes regulation of "modifications" that increase HAP emissions above "de minimis levels." ADEQ and business stakeholders have different legal positions over whether the ADEQ Director can establish "de minimis levels" for federal HAPs, or whether the Arizona Legislature intended that they be established only by the EPA Administrator. The problem arises because EPA ultimately decided not to establish "de minimis levels" for federal HAPs. A gap in the State HAP statute can be corrected only by the Legislature, not by ADEQ.

The joint business strawman proposal that accompanies this letter recommends alternative approaches to these issues. It represents a good faith effort to propose a State HAP program that fully complies with the State HAP statute as an alternative to ADEQ's October 12th draft. It was prepared in the limited time provided by ADEQ's expedited stakeholder process. As explained in our September 8, 2005 letter, we believe that ADEQ should devote more time to work with stakeholders to achieve a consensus on this important and complex regulatory program.

Sincerely,

ARIZONA ASSOCIATION OF INDUSTRY



JAMES TUNNELL
Vice President of Policy and Operations

ARIZONA CHAMBER OF COMMERCE



JAMES J. APPERSON
CEO and President

ARIZONA ELECTRONICS ASSOCIATION



CORY MILLER
Executive Director

ARIZONA MINING ASSOCIATION



SYDNEY HAY
Executive Director

**ARIZONA ROCK PRODUCTS
ASSOCIATION**



RUSSELL "RUSTY" BOWERS
Executive Director

ARIZONA TECHNOLOGY COUNCIL



RON SCHOTT
CEO and President

**ASSOCIATED GENERAL CONTRACTORS -
ARIZONA CHAPTER**



AMANDA MCGENNIS
Senior Vice-President

**GREATER PHOENIX CHAMBER OF
COMMERCE**



JAY KAPROSY
Vice President - Public Affairs

cc: S. Burr

TABLE OF CONTENTS

JOINT BUSINESS STRAWMAN RULE..... TAB 1

Article 17. State Hazardous Air Pollutant Program

AMBIENT AIR CONCENTRATIONS TAB 2

Technical Memorandum Additional Comments on Arizona Department of Environmental Quality Ambient Air Criteria for Hazardous Air Pollutants Prepared by Exponent, October, 2005

Technical Memorandum Comments on Arizona Department of Environmental Quality Ambient Air Criteria for Hazardous Air Pollutants Prepared by Exponent, September, 2005

AMBIENT AIR BOUNDARY TAB 3

ADEQ's Use of "Process Area Boundary" to Calculate Ambient Air Concentrations Is Contrary to Law and Should Not Apply to the Risk Management Analysis

HAP MINOR SOURCE CATEGORY DESIGNATIONS TAB 4

Comparison of Joint Business and ADEQ Methods For Source Category Listings

Designation of State HAP Minor Source Categories Pursuant to A.R.S. § 49-426.05(A)

Exposure Modeling Proposal For Identifying Hazardous Air Pollutant Source Categories Under A.R.S. § 49-426-05(A) Prepared by Patrick Allen Ryan, Ph.D., October 19, 2005

Science and Technical Comments Prepared by Patrick Allen Ryan, Ph.D., September 9, 2005

DE MINIMIS LEVELS TAB 5

Authority to Establish De Minimis Levels for Federal Hazardous Air Pollutants

STATE HAP EMISSIONS CAP..... TAB 6

Establishment of a HAPs Emissions Cap

MACT AND HAPRACT STANDARDS	TAB 7
<i>HAPRACT Requirements May Not Mandate the Use of Control Technology More Stringent Than MACT</i>	

Adoption of MACT and HAPRACT Standards

RISK MANAGEMENT ANALYSIS	TAB 8
---------------------------------------	--------------

APPENDIX	TAB 9
<i>Joint Business Letter to Nancy C. Wrona dated September 8, 2005</i>	

TAB 1

JOINT BUSINESS STRAWMAN RULE

JOINT BUSINESS REVISION OF ADEQ 10/12/05 STRAWMAN
(10/20/05)

Due to the need to circulate this redline for review and approval by various associations prior to October 26, the drafters had only one week to consider ADEQ's strawman. Additional comments or revisions may be offered as ADEQ's process continues.

ARTICLE 17. ARIZONA STATE HAZARDOUS AIR POLLUTANTS PROGRAM

R18-2-1701. Definitions

The following definitions, ~~and~~ In addition to the general definitions contained in Article 1 of this Chapter and A.R.S. § 49-401.01 (unless the context otherwise indicates), the following definitions apply to this Article unless the context otherwise applies and solely to this Article.

1. "Acute adverse effects to human health" means those effects described in paragraph 3 of this Section that are of short duration or rapid onset. **[CONSIDER WHETHER NECESSARY AND APPROPRIATE BASED ON EXPONENT COMMENTS]**
2. "Acute Ambient Air Concentration (AAAC)" means that concentration of a hazardous air pollutant, in the ambient air, above which it is predicted that the general population, including susceptible populations, could experience acute adverse effects to human health. **[CONSIDER WHETHER NECESSARY AND APPROPRIATE BASED ON EXPONENT AND AMBIENT AIR COMMENTS]**
3. "Adverse effects to human health" means those effects that result in or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness, including adverse effects that are known to be or may reasonably be anticipated to be caused by substances that are acutely toxic, chronically toxic, carcinogenic, mutagenic, teratogenic, neurotoxic or causative of reproductive dysfunction. **[CONSIDER WHETHER NECESSARY AND APPROPRIATE BASED ON EXPONENT COMMENTS]**
4. "Adverse environmental effect" means any significant and widespread adverse effect which may reasonably be anticipated on wildlife, aquatic life, or other natural resources, including adverse impacts on populations of endangered or threatened species or significant degradation of environmental quality over broad areas. **[CONSIDER WHETHER NECESSARY AND APPROPRIATE BASED ON EXPONENT COMMENTS]**
5. "Ambient air concentration (AAC)" means that concentration of a hazardous air pollutant ~~in the ambient air, listed in R18-2-1708(C)(D)(1) or determined in accordance with R18-2-1708(C)(D)(2), or (C)(D)(3), or R18-2-1708(E), above which it is predicted that the general population, including susceptible populations, could experience adverse effects to human health.~~ **[CONSIDER WHETHER "AMBIENT AIR CONCENTRATION" IS AN APPROPRIATE NAME]**

6. “Arizona maximum achievable control technology” or “AZMACT” means an emission standard that requires the maximum degree of reduction in emissions of the hazardous air pollutants subject to this chapter, including a prohibition on such emissions where achievable, and that the dDirector, after considering the cost of achieving such emission reduction and any non-air quality health and environmental impacts and energy requirements, determines to be achievable by an affected source to which such standard applies, through application of measures, processes, methods, systems or techniques including measures which:
- Reduce the volume of, or eliminate emissions of, such pollutants through process changes, substitution of materials or other modifications;
 - Enclose systems or processes to eliminate emissions;
 - Collect, capture or treat such pollutants when released from a process, stack, storage or fugitive emissions point;
 - Are design, equipment, work practice, or operational standards, including requirements for operator training or certification; or
 - Are a combination of the above.
7. “Chemical Abstract Service (CAS) Number” means a unique, identifying number assigned by the Chemical Abstract Service to each distinct chemical substance.
8. “Chronic adverse effects to human health” means those effects described in paragraph 3 of this Section that are of a persistent, recurring, or long-term nature or that are delayed in their onset. **[CONSIDER WHETHER NECESSARY AND APPROPRIATE BASED ON EXPONENT COMMENTS]**
9. “Chronic Ambient Air Concentration (CAAC)” means that concentration of a hazardous air pollutant, in the ambient air, above which it is predicted that the general population, including susceptible populations, could experience chronic adverse effects to human health. **[CONSIDER WHETHER NECESSARY AND APPROPRIATE BASED ON EXPONENT AND AMBIENT AIR COMMENTS]**
10. “De minimis amount” means, in reference to a net actual emissions increase of a hazardous air pollutant or a hazardous air pollutant not previously emitted, the rate of emissions that would equal or exceed a de minimis amount established by the Administrator. **[SEE JOINT BUSINESS POSITION PAPER]**
11. “Existing” source means:
- A major source of HAPs that commences construction, begins actual construction, or completes construction before the relevant modification; or
 - A minor source of HAPs that, before the relevant modification, is in one of the source categories in Table 2 of R18-2-1702 and that commences construction,

begins actual construction, or completes construction before the relevant modification.

102. ~~“Federally listed hazardous air pollutant” means any air pollutant adopted under R18-2-1703~~ any air pollutant listed in or pursuant to § 112(b) of the Act as modified under subpart C of 40 C.F.R. Part 63 as set forth in R18-2-1703.
143. “Hazardous air pollutant” means any federally listed hazardous air pollutant.
124. “Hazardous air pollutant reasonably available control technology” or “HAPRACT” means an emissions standard for hazardous air pollutants which the ~~d~~Director, acting pursuant to section 49-426.06, subsection C, or the ~~e~~Control ~~e~~Officer, acting under section 49-480.04, subsection C, determines is reasonably available for a source. In making the foregoing determination the ~~d~~Director or ~~e~~Control ~~e~~Officer shall take into consideration the estimated actual air quality impact of the standard, the cost of complying with the standard, the demonstrated reliability and widespread use of the technology required to meet the standard and any non-air quality health and environmental impacts and energy requirements. For purposes of this definition, an emissions standard may be expressed as a numeric emissions limitation or as a design, equipment, work practice or operational standard.
135. “Major source of state hazardous air pollutants (HAPs)” means:
- a. ~~A~~ stationary source that emits or has the potential to emit in the aggregate, including fugitive emissions, ten (10) tons per year or more of any state hazardous air pollutant or twenty-five (25) tons per year or more of any combination of state hazardous air pollutants.
 - b. ~~Any change to a minor source of hazardous air pollutants that would increase its emissions to the qualifying levels in subsection (a).~~
146. “Minor source of state hazardous air pollutants (HAPs)” means:
- a. ~~A~~ stationary source that emits or has the potential to emit, including fugitive emissions, one ton or more but less than 10 tons per year of any hazardous air pollutant or two and one-half tons or more but less than 25 tons per year of any combination of hazardous air pollutants.
 - b. ~~Any change to a source of hazardous air pollutants that would increase its emissions to the qualifying levels in subsection (a).~~
157. “Modification” or “modify” means a physical change in, or change in the method of operation of, a source which increases the actual emissions [CONSIDER ACTUAL TO POTENTIAL ISSUES] of any state hazardous air pollutant (HAP) emitted by the source by more than any de minimis amount listed in Table 4, or which results in the emission of any HAP previously emitted by the source by more than any de minimis amount listed in Table 4.

a. ~~A physical change in, or change in the method of operation of, a source which increases the actual emissions of any state HAP by that source is a modification if it results in total source emissions that exceed one ton per year of any individual HAP or two and one half tons per year of any combination of HAPs.~~

ba. ~~A physical change in, or change in the method of operation of, a source is not a modification subject to this section if~~ For purposes of this definition, the following are not a physical change or change in the method of operation:

- i. The change, together with any other changes implemented or planned by the source, qualifies for an alternative emission limitation under § 112(i)(5) of the Clean Air Act.
- ii. The change is required under a standard imposed under § 112(d) or § 112(f) of the Clean Air Act and the change is implemented after the Administrator promulgates the standard.
- iii. The change is routine maintenance, repair or replacement.
- iv. The change is the use of an alternative fuel or raw material by reason of an order under Sections 2(a) and (b) of the Energy Supply and Environmental Coordination Act of 1974, 15 U.S.C. 792, or by reason of a natural gas curtailment plan under the Federal Power Act, 16 U.S.C. 792 - 825r;
- v. The change is the use of an alternative fuel by reason of an order or rule under Section 125 of the Act;
- vi. The change is the use of an alternative fuel at a steam generating unit to the extent that the fuel is generated from municipal solid waste;
- vii. The change is the use of an alternative fuel or raw material by a stationary source that either:
 - (1) The source was capable of accommodating before ~~December 12, 1976~~[the effective date of Article 17], unless the change would be prohibited under any federally enforceable permit condition established after ~~December 12, 1976~~[the effective date of Article 17], under 40 CFR 52.21, or under Articles 3 or 4 of this Chapter; or
 - (2) The source is approved to use under any permit issued under 40 CFR 52.21, or under Articles 3 or 4 of this Chapter.
- viii. The change is an increase in the hours of operation or in the production rate, unless the change would be prohibited under any federally enforceable permit condition established after [the effective date of Article 17]~~December 12, 1976~~, under 40 CFR 52.21, or under Articles 3 or 4 of this Chapter.

- ix. The change is any change in ownership at a stationary source;
- x. The change is the addition, replacement, or use of a pollution control project at an existing electric utility steam generating unit, unless the Director determines that the addition, replacement, or use renders the unit less environmentally beneficial, or except:
 - (1) When the Director has reason to believe that the pollution control project would result in a significant net increase in representative actual annual emissions of any criteria pollutant over levels used for that source in the most recent Title I air quality impact analysis in the area, if any, and
 - (2) The Director determines that the increase will cause or contribute to a violation of any national ambient air quality standard or PSD increment, or visibility limitation;
- xi. The change is the installation, operation, cessation, or removal of a temporary clean coal technology demonstration project, if the project complies with:
 - (1) The SIP, and
 - (2) Other requirements necessary to attain and maintain the national ambient air quality standards during the project and after it is terminated;
- xii. For electric utility steam generating units ~~located in attainment and unclassifiable areas only~~, the change is the installation or operation of a permanent clean coal technology demonstration project that constitutes repowering, if the project does not result in an increase in the potential to emit any regulated pollutant emitted by the unit. This exemption applies on a pollutant-by-pollutant basis; and
- xiii. For electric utility steam generating units ~~located in attainment and unclassifiable areas only~~, the change is the reactivation of a very clean coal-fired electric utility steam generating unit.
- xiv. A change made under a State HAP emissions cap in accordance with R18-2-306.02,
- xv. The change is required under a AZMACT or HAPRACT requirement imposed pursuant to this Article.

[REVIEW NSR REFORM RULE FOR OTHER POTENTIAL EXEMPTIONS AND REVISIONS]

[SEE DE MINIMIS POSITION PAPER]

Table 1. State HAPs De Minimis Levels

Chemical	De Minimis (lb/hr)	De Minimis (lb/yr)
1,1,1-Trichloroethane (Methyl Chloroform)	117	14,247
1,1,2,2-Tetrachloroethane	N/A	0.20
1,3-Butadiene	N/A	0.39
1,4-Dichlorobenzene	N/A	1.9
2,2,4-Trimethylpentane	51	N/A
2,4-Dinitrotoluene	N/A	0.13
2-Chloroacetophenone	N/A	0.19
Acetaldehyde	N/A	5.3
Acetophenone	1.4	2,261
Acrolein	0.013	0.129
Acrylonitrile	N/A	0.17
Antimony Compounds (Selected compound: Antimony)	0.71	9.0
Arsenic Compounds (Selected compound: Arsenic)	N/A	0.0027
Benzene	N/A	1.5
Benzyl Chloride	N/A	0.25
Beryllium Compounds (Selected compound: Beryllium)	7.07E-04	0.0049
Biphenyl	2.1	1,130
bis(2-Ethylhexyl) Phthalate	0.71	3.0
Bromoform	0.42	11
Cadmium Compounds (Selected compound: Cadmium)	N/A	0.0065
Carbon Disulfide	18	4,522
Carbon Tetrachloride	N/A	0.78
Carbonyl Sulfide	1.7	N/A
Chlorobenzene	57	6,442
Chloroform	N/A	2.2
Chromium Compounds (Selected compound: Hexavalent Chromium)	N/A	0.0010
Cobalt Compounds (Selected compound: Cobalt)	N/A	0.0042
Cumene	53	2,583
Cyanide Compounds (Selected compound: Hydrogen Cyanide)	0.22	19
Dibenzofurans	1.4	45

Dichloromethane (Methylene Chloride)	20	25
Dimethyl formamide	9.3	194
Dimethyl Sulfate	0.018	N/A
Ethyl Benzene	14	6,442
Ethyl Chloride (Chloroethane)	71	64,420
Ethylene Dibromide (Dibromoethane)	N/A	0.020
Ethylene Dichloride (1,2-Dichloroethane)	N/A	0.45
Ethylene glycol	2.8	2,583
Ethylidene Dichloride (1,1-Dichloroethane)	354	3,230
Formaldehyde	N/A	0.90
Glycol Ethers (Selected compound: Diethylene glycol, monoethyl ether)	14	19
Hexachlorobenzene	N/A	0.026
Hexane	659	13,689
Hydrochloric Acid	0.93	129
Hydrogen Fluoride (Hydrofluoric Acid)	0.56	90
Isophorone	0.71	12,946
Manganese Compounds (Selected compound: Manganese)	0.14	0.32
Mercury Compounds (Selected compound: Elemental Mercury)	0.058	1.9
Methanol	53	25,830
Methyl Bromide	15	32
Methyl Chloride	67	582
Methyl Ethyl Ketone	284	32,272
Methyl Hydrazine	N/A	0.0024
Methyl Isobutyl Ketone (Hexone)	28	19,388
Methyl Methacrylate	18	4,522
Methyl Tert Butyl Ether	N/A	46
N, N-Dimethylaniline	1.4	45
Naphthalene	N/A	0.35
Nickel Compounds (Selected compound: Nickel Refinery Dust)	N/A	0.049
Phenol	3.3	1,295
Polychlorinated Biphenyls (Selected Compound: Aroclor 1254)	N/A	0.12
Polycyclic Organic Matter (Selected compound: Benzo(a)pyrene)	N/A	0.013
Propionaldehyde	N/A	5.3
Propylene Dichloride	14	26

Selenium Compounds (Selected compound: Selenium)	0.028	113
Styrene	31	6,442
Tetrachloroethylene (Perchloroethylene)	N/A	2.0
Toluene	109	146,766
Trichloroethylene	N/A	0.10
Vinyl Acetate	22	1,295
Vinyl Chloride	N/A	1.3
Vinylidene Chloride (1,2-Dichloroethylene)	2.1	1,295
Xylene (Mixed Isomers)	98	644

18. “New” source means:

- a. A major source of HAPs that is not an existing source under R18-2-1701(11)(a);
or
- b. A minor source of HAPs that is not an existing source under R18-2-1701(11)(b) and that, before commencing construction, is in one of the source categories in Table 2 of R18-2-1702.

169. “Potential to emit” or “potential emission rate” means the maximum capacity of a stationary source to emit a pollutant, excluding secondary emissions, taking into account controls that are enforceable under any federal, state or local law, rule or regulation or that are inherent in the design of the source.

1720. “SIC Code” means the standard industrial classification code number for a source category derived from 1987 Standard Industrial Classification Manual (U.S. Office of Management and Budget, 1987).

1821. “State hazardous air pollutant” (HAP) means any federally listed hazardous air pollutant.

1922. “Technology transfer” means the process by which existing control technologies that have been successfully applied in other source categories that have similar processes or emissions units are reviewed for potential use in the applicant's source category.

R18-2-1702. Applicability

A. The provisions of this Article apply to:

1. Minor sources of state hazardous air pollutants that are in one of the source categories listed in Table 2; and
2. Major sources of state hazardous air pollutants.

Table 2. State HAPs Minor Source Categories
[DISAGREE – SHOULD BE RECONSIDERED BASED ON
JOINT BUSINESS PROPOSED METHODOLOGY]

SIC	Code-Primary Source Category
1021	Copper Ores
2434	Wood Kitchen Cabinets
2451	Mobile Homes
2621	Paper Mills
2679	Converted Paper Products, n.e.c.1
2851	Paints and Allied Products
2911	Petroleum Refining
3086	Plastics Foam Products
3088	Plastics Plumbing Fixtures
3089	Plastics Products, n.e.c.1
3241	Cement, Hydraulic
3281	Cut Stone and Stone Products
3296	Mineral Wool
3312	Blast Furnaces and Steel mills
3331	Primary Copper
3411	Metal Cans
3444	Sheet Metal Work
3451	Screw Machine Products
3479	Metal Coating and Allied Services
3585	Refrigeration and Heating Equipment
3672	Printed Circuit Boards
3999	Mfg. Industries, n.e.c.1
4922	Natural Gas Transmission
5169	Chemicals and Allied Products, n.e.c.1
5171	Petroleum Bulk Stations and Terminals

¹ Not Elsewhere Classified

- B.** The provisions of this Article shall not apply to: ~~emissions units~~
1. Affected sources for which a standard under 40 C.F.R. Part 63 is an applicable requirement.
 2. Affected sources at a minor source of state HAPs that is in a source category for which a standard under 40 C.F.R. Part 63 has been adopted and that agrees to comply with the emissions limitations of the relevant Part 63 standard under a voluntarily accepted emissions limitation under R18-2-306.01.
- C.** If the Clean Air Act has established provisions including specific schedules for the regulation of source categories under Section 112(e)(5) and 112(n), those provisions and schedules shall apply to the regulation of those source categories.

- D. For any category or subcategory of facilities licensed by the Nuclear Regulatory Commission, the Director shall not adopt or enforce any standard or limitation respecting emissions of radionuclides which is more stringent than the standard or limitation adopted by the Administrator under Section 112 of the Act.
- E. When the Administrator makes one of the following findings pursuant to Section 112(n)(1)(A) of the Act, the finding is effective for purposes of the state's administration and enforcement of this Article in the same manner as prescribed by the Administrator:
1. A finding that regulation is not appropriate or necessary.
 2. A finding that alternative control strategies should be applied.
- F. As part of the Risk Management Analysis, an applicant may voluntarily propose emissions limitations under R18-2-306.01 in order to avoid being subject to HAPRACT under R18-2-1706 or AZMACT under R18-2-1707.

R18-2-1703. State list of hazardous air pollutants

All of the following federally listed hazardous air pollutants listed in § 112(b)(1) of the Clean Air Act, 42 U.S.C. § 7412(b)(1), as modified by subpart C of 40 C.F.R. Part 63, are adopted:

1. Acetaldehyde (CAS 75070)
2. Acetamide (CAS 60355)
3. Acetonitrile (CAS 75058)
4. Acetophenone (CAS 98862)
5. 2-Acetylaminofluorene (CAS 53963)
6. Acrolein (CAS 107028)
7. Acrylamide (CAS 79061)
8. Acrylic acid (CAS 79107)
9. Acrylonitrile (CAS 107131)
10. Allyl chloride (CAS 107051)
11. 4-Aminobiphenyl (CAS 92671)
12. Aniline (CAS 62533)
13. o-Anisidine (CAS 90040)
14. Asbestos (CAS 1332214)
15. Benzene (including benzene from gasoline) (CAS 71432)
16. Benzidine (CAS 92875)
17. Benzotrichloride (CAS 98077)
18. Benzyl chloride (CAS 100447)
19. Biphenyl (CAS 92524)
20. Bis(2-ethylhexyl)phthalate (DEHP) (CAS 117817)
21. Bis(chloromethyl)ether (CAS 542881)
22. Bromoform (CAS 75252)
23. 1,3-Butadiene (CAS 106990)
24. Calcium cyanamide (CAS 156627)
25. Captan (CAS 133062)

26. Carbaryl (CAS 63252)
27. Carbon disulfide (CAS 75150)
28. Carbon tetrachloride (CAS 56235)
29. Carbonyl sulfide (CAS 463581)
30. Catechol (CAS 120809)
31. Chloramben (CAS 133904)
32. Chlordane (CAS 57749)
33. Chlorine (CAS 7782505)
34. Chloroacetic acid (CAS 79118)
35. 2-Chloroacetophenone (CAS 532274)
36. Chlorobenzene (CAS 108907)
37. Chlorobenzilate (CAS 510156)
38. Chloroform (CAS 67663)
39. Chloromethyl methyl ether (CAS 107302)
40. Chloroprene (CAS 126998)
41. Cresols/Cresylic acid (isomers and mixture) (CAS 1319773)
42. o-Cresol (CAS 95487)
43. m-Cresol (CAS 108394)
44. p-Cresol (CAS 106445)
45. Cumene (CAS 98828)
46. 2,4-D,salts and esters (CAS 94757)
47. DDE (CAS 3547044)
48. Diazomethane (CAS 334883)
49. Dibenzofurans (CAS 132649)
50. 1,2-Dibromo-3-chloropropane (CAS 96128)
51. Dibutylphthalate (CAS 84742)
52. 1,4-Dichlorobenzene(p) (CAS 106467)
53. 3,3-Dichlorobenzidene (CAS 91941)
54. Dichloroethyl ether (Bis(2-chloroethyl)ether) (CAS 111444)
55. 1,3-Dichloropropene (CAS 542756)
56. Dichlorvos (CAS 62737)
57. Diethanolamine (CAS 111422)
58. N,N-Diethylaniline (N,N-Dimethylaniline) (CAS 121697)
59. Diethyl sulfate (CAS 64675)
60. 3,3-Dimethoxybenzidine (CAS 119904)
61. Dimethyl aminoazobenzene (CAS 60117)
62. 3,3'-Dimethyl benzidine (CAS 119937)
63. Dimethyl carbamoyl chloride (CAS 79447)
64. Dimethyl formamide (CAS 68122)
65. 1,1-Dimethyl hydrazine (CAS 57147)
66. Dimethyl phthalate (CAS 131113)
67. Dimethyl sulfate (CAS 77781)
68. 4,6-Dinitro-o-cresol, and salts (CAS 534521)
69. 2,4-Dinitrophenol (CAS 51285)
70. 2,4-Dinitrotoluene (CAS 121142)
71. 1,4-Dioxane (1,4-Diethyleneoxide) (CAS 123911)

72. 1,2-Diphenylhydrazine (CAS 122667)
73. Epichlorohydrin (1-Chloro-2,3-epoxypropane) (CAS 106898)
74. 1,2-Epoxybutane (CAS 106887)
75. Ethyl acrylate (CAS 140885)
76. Ethyl benzene (CAS 100414)
77. Ethyl carbamate (Urethane) (CAS 51796)
78. Ethyl chloride (Chloroethane) (CAS 75003)
79. Ethylene dibromide (Dibromoethane) (CAS 106934)
80. Ethylene dichloride (1,2-Dichloroethane) (CAS 107062)
81. Ethylene glycol (CAS 107211)
82. Ethylene imine (Aziridine) (CAS 151564)
83. Ethylene oxide (CAS 75218)
84. Ethylene thiourea (CAS 96457)
85. Ethylidene dichloride (1,1-Dichloroethane) (CAS 75343)
86. Formaldehyde (CAS 50000)
87. Heptachlor (CAS 76448)
88. Hexachlorobenzene (CAS 118741)
89. Hexachlorobutadiene (CAS 87683)
90. Hexachlorocyclopentadiene (CAS 77474)
91. Hexachloroethane (CAS 67721)
92. Hexamethylene-1,6-diisocyanate (CAS 822060)
93. Hexamethylphosphoramide (CAS 680319)
94. Hexane (CAS 110543)
95. Hydrazine (CAS 302012)
96. Hydrochloric acid (CAS 7647010)
97. Hydrogen fluoride (Hydrofluoric acid) (CAS 7664393)
98. Hydroquinone (CAS 123319)
99. Isophorone (CAS 78591)
100. Lindane (all isomers) (CAS 58899)
101. Maleic anhydride (CAS 108316)
102. Methanol (CAS 67561)
103. Methoxychlor (CAS 72435)
104. Methyl bromide (Bromomethane) (CAS 74839)
105. Methyl chloride (Chloromethane) (CAS 74873)
106. Methyl chloroform (1,1,1-Trichloroethane) (CAS 71556)
107. Methyl ethyl ketone (2-Butanone) (CAS 78933)
108. Methyl hydrazine (CAS 60344)
109. Methyl iodide (Iodomethane) (CAS 74884)
110. Methyl isobutyl ketone (Hexone) (CAS 108101)
111. Methyl isocyanate (CAS 624839)
112. Methyl methacrylate (CAS 80626)
113. Methyl tert butyl ether (CAS 1634044)
114. 4,4-Methylene bis(2-chloroaniline) (CAS 101144)
115. Methylene chloride (Dichloromethane) (CAS 75092)
116. Methylene diphenyl diisocyanate (MDI) (CAS 101688)
117. 4,4'-Methylenedianiline (CAS 101779)

118. Naphthalene (CAS 91203)
119. Nitrobenzene (CAS 98953)
120. 4-Nitrobiphenyl (CAS 92933)
121. 4-Nitrophenol (CAS 100027)
122. 2-Nitropropane (CAS 79469)
123. N-Nitroso-N-methylurea (CAS 684935)
124. N-Nitrosodimethylamine (CAS 62759)
125. N-Nitrosomorpholine (CAS 59892)
126. Parathion (CAS 56382)
127. Pentachloronitrobenzene (Quintobenzene) (CAS 82688)
128. Pentachlorophenol (CAS 87865)
129. Phenol (CAS 108952)
130. p-Phenylenediamine (CAS 106503)
131. Phosgene (CAS 75445)
132. Phosphine (CAS 7803512)
133. Phosphorus (CAS 7723140)
134. Phthalic anhydride (CAS 85449)
135. Polychlorinated biphenyls (Aroclors) (CAS 1336363)
136. 1,3-Propane sultone (CAS 1120714)
137. beta-Propiolactone (CAS 57578)
138. Propionaldehyde (CAS 123386)
139. Propoxur (Baygon) (CAS 114261)
140. Propylene dichloride (1,2-Dichloropropane) (CAS 78875)
141. Propylene oxide (CAS 75569)
142. 1,2-Propylenimine (2-Methyl aziridine) (CAS 75558)
143. Quinoline (CAS 91225)
144. Quinone (CAS 106514)
145. Styrene (CAS 100425)
146. Styrene oxide (CAS 96093)
147. 2,3,7,8-Tetrachlorodibenzo-p-dioxin (CAS 1746016)
148. 1,1,2,2-Tetrachloroethane (CAS 79345)
149. Tetrachloroethylene (Perchloroethylene) (CAS 127184)
150. Titanium tetrachloride (CAS 7550450)
151. Toluene (CAS 108883)
152. 2,4-Toluene diamine (CAS 95807)
153. 2,4-Toluene diisocyanate (CAS 584849)
154. o-Toluidine (CAS 95534)
155. Toxaphene (chlorinated camphene) (CAS 8001352)
156. 1,2,4-Trichlorobenzene (CAS 120821)
157. 1,1,2-Trichloroethane (CAS 79005)
158. Trichloroethylene (CAS 79016)
159. 2,4,5-Trichlorophenol (CAS 95954)
160. 2,4,6-Trichlorophenol (CAS 88062)
161. Triethylamine (CAS 121448)
162. Trifluralin (CAS 1582098)
163. 2,2,4-Trimethylpentane (CAS 540841)

164. Vinyl acetate (CAS 108054)
165. Vinyl bromide (CAS 593602)
166. Vinyl chloride (CAS 75014)
167. Vinylidene chloride (1,1-Dichloroethylene) (CAS 75354)
168. Xylenes (isomers and mixture) (CAS 1330207)
169. o-Xylenes (CAS 95476)
170. m-Xylenes (CAS 108383)
171. p-Xylenes (CAS 106423)
172. Antimony Compounds
173. Arsenic Compounds (inorganic including arsine)
174. Beryllium Compounds
175. Cadmium Compounds
176. Chromium Compounds
177. Cobalt Compounds
178. Coke Oven Emissions

179. Cyanide Compounds (X, CN where X = H' or any other group where a formal Dissociation may occur. For example KCN or Ca(CN[2].)

180. Glycol ethers
 - a. Glycol ethers includes mono- and di- ethers of ethylene glycol, diethylene glycol, and triethylene glycol R-(O₂H₂CH₂)[N]-OR' where:
 - i. n = 1, 2, or 3; R = alkyl or aryl groups;
 - ii. R' = R, H, or groups which, when removed, yield glycol ethers with the structure: R-(OCH₂CH)[N]-OH. Polymers are excluded from the glycol category.
 - b. Glycol ethers does not include ethylene glycol monobutyl ether and surfactant alcohol ethoxylates and their derivatives (SAED).

181. Lead Compounds
182. Manganese Compounds
183. Mercury Compounds

184. Fine Mineral Fibers including mineral fiber emissions from facilities manufacturing or processing glass, rock or slag (or other mineral derived fibers) of average diameter 1 micrometer or less.

185. Nickel Compounds

186. Polycyclic Organic Matter including organic compounds with more than one benzene ring, and which have a boiling point greater than or equal to 100 degrees C.

187. Radionuclides, including radon. (Radionuclide is a type of atom which spontaneously undergoes radioactive decay.)

188. Selenium Compounds

R18-2-1704. Notice of Types and Amounts of HAPs

~~The~~ An owner or operator of a source required to obtain a permit or permit revision ~~subject pursuant to this Article shall provide the Director with notification, in a~~ the permit application, of the types and amounts of HAPs emitted by the source, ~~by providing from~~ readily available data regarding emissions from the source. The Director shall not require the owner or operator to conduct performance tests, sampling or monitoring in order to fulfill the requirements of this subsection.

R18-2-1705. Modifications; Permits; Permit Revisions

- A. Any person who constructs a new source or modifies an existing source that is subject to R18-2-1702 must first obtain a permit or significant permit revision for the new source or the modification that complies with Article 3 of this Chapter, and subsection (B) or (C) of this Section.
- B. A permit or significant permit revision that is issued to a new or modified source that is subject to this program under R18-2-1702(A)(1) shall impose HAPRACT under R18-2-1706 for the new source or the modification, unless the applicant demonstrates, with a Risk Management Analysis under R18-2-1708, that the imposition of HAPRACT is not necessary to avoid adverse effects to human health or adverse environmental effects.
- C. A permit or significant permit revision that is issued to a new or modified source that is subject to this program under R18-2-1702(A)(2) shall impose AZMACT under R18-2-1707 for the new source or the modification, unless the applicant demonstrates, with a Risk Management Analysis under R18-2-1708 that the imposition of AZMACT is not necessary to avoid adverse effects to human health or adverse environmental effects.
- D. The Director may establish HAPRACT for a source or source category in a general permit according to Article 5 of this Chapter.
 - 1. The owner or operator of a source covered by that general permit may obtain a variance from HAPRACT by complying with R18-2-1708 at the time the source applies to be permitted under the general permit.
 - 2. If the owner or operator makes the applicable demonstration required by R18-2-1708 and otherwise qualifies for the general permit, the Director shall approve the application according to A.R.S. § 49-426 and issue an authorization-to-operate granting a variance from the specific provisions of the general permit relating to HAPRACT.
 - 3. Except as otherwise modified by a variance, the general permit shall govern the source.
- E. When determining whether HAP emissions from a new source or modification exceed the thresholds prescribed by R18-2-17021(15) or R18-2-1701(16), or a de minimis

amount described in R18-2-1701(10) ~~Table 1~~, the director shall exclude particulate matter emissions that consist of natural crustal material and are produced either by natural forces, such as wind or erosion, or by anthropogenic activities, such as agricultural operations, excavation, blasting, drilling, handling, storage, earth moving, crushing, grinding or traffic over paved or unpaved roads, or other similar activities.

F. HAPRACT or AZMACT imposed pursuant to this Article shall apply only to the emissions from the new source or the modification of state HAPs in amounts exceeding the de minimis amounts established by the Administrator and that are not already subject to federal MACT, AZMACT, or HAPRACT.

FG. In addition to the requirements of Title 18, Chapter 2, Appendix 1 “Standard Permit Application Form and Filing Instructions,” an application for a permit or permit revision required under this Section shall include one of the following:

1. The applicant’s proposal and documentation for HAPRACT under R18-2-1706;
2. The applicant’s proposal and documentation for MACT under R18-2-1707.
3. A risk management analysis submitted under R18-2-1708.

[SEE COMMENTS ON R18-2-1706, 1707, 1708]

GH. Any applicant for a permit or permit revision under this Article may request accelerated permit processing under R18-2-326(I).

I. Any modification at a minor source of HAPs that would increase the minor source’s emissions to the qualifying levels in R18-2-1701(5) shall comply with the requirements of R18-2-1705(B) for modifications.

R18-2-1706. Case-by-Case HAPRACT Determination

[IT IS PROPOSED THAT THIS SECTION BE REVISED TO PROVIDE THAT HAPRACT IS PROMULGATED BY RULE, UNLESS AN APPLICANT SEEKS A VOLUNTARY CASE-BY-CASE HAPRACT. SEE JOINT BUSINESS POSITION PAPER.]

- A. The applicant shall include in the application sufficient documentation to show that the proposed control technology or methodology meets the requirements of A.R.S. § 49-426.06 and this Section.
- B. An applicant subject to R18-2-1705(B) shall propose HAPRACT for the new source or modification, to be included in the applicant’s permit or significant permit revision. The applicant shall document each of the following steps:
 1. The applicant shall identify the range of applicable control technologies, including:

- a. A survey of similar emission sources to determine the emission limitations currently achieved in practice in the United States;
 - b. Controls applied to similar source categories, emissions units, or gas streams through technology transfer; and
 - c. Innovative technologies that are demonstrated to be reliable, that reduce emissions for the HAP under review at least to the extent achieved by the control technology that would otherwise have been proposed and that meets all the requirements of A.R.S. § 49-426.06 and this Section.
2. The applicant shall propose as HAPRACT one of the control technologies identified under subsection (B)(1), and shall provide:
 - a. The rationale for selecting the specific control technologies from the range identified in subsection (B)(1)
 - b. Estimated control efficiency, described as percent HAP removed;
 - c. Expected emission rate in tons per year and pounds per hour;
 - d. Expected emission reduction in tons per year and pounds per hour;
 - e. Economic impacts and cost effectiveness of implementing the proposed control technology;
 - f. Other environmental impacts of the proposed control technology; and
 - g. Energy impacts of the proposed technology.
 3. The applicant shall identify rejected control technologies identified in subsection (B)(1), and shall provide for each rejected control technology:
 - a. The rationale for rejecting the specific control technologies identified in subsection (B)(1);
 - b. Estimated control efficiency, described as percent HAP removed;
 - c. Expected emission rates in tons per year and pounds per hour;
 - d. Expected emission reduction in tons per year and pounds per hour;
 - e. Economic impacts and cost effectiveness of implementing the rejected control technologies;
 - f. Other environmental impacts of the rejected control technology; and
 - g. Energy impacts of the rejected control technologies.

- C. The Director shall determine whether the applicant's HAPRACT selection complies with A.R.S. § 49-426.06 and this Section, based on the documentation provided in subsection (B),
1. If the Director finds that the applicant's proposal complies with A.R.S. § 49-426.06 and this Section, the applicant's proposed HAPRACT selection shall be included in the permit or permit revision.
 2. If the Director finds that the applicant's proposal fails to comply with A.R.S. § 49-426.06 and this Section, the Director shall:
 - a. Notify the applicant that the proposal has failed to meet requirements;
 - b. Specify the deficiencies in the proposal; and
 - c. State that the applicant shall submit a new HAPRACT proposal, in accordance with the provisions on licensing time frames in Chapter 1, Article 5 of this Title.
 3. If the applicant does not submit a new proposal, the Director may deny the application for a permit or permit revision.
 4. If the Director finds that the new proposal fails to comply with A.R.S. § 49-426.06 and this Section, the Director may deny the application for a permit or permit revision.
- D. If the Director finds that a reliable method of measuring HAP emissions is not available, the Director shall require compliance with a design, equipment, work practice or operational standard, or combination of these, but shall not impose a numeric emissions limitation.
- E. The Director shall not impose ~~a control technology~~ a standard under this Section that would require the application of measures that are incompatible with measures required under Article 11 or 40 C.F.R. Part 63. An applicable control technology for a source or source category that is promulgated by the Administrator shall supersede control technology imposed by the Director for that source or source category.
- F. The control measures required by a HAPRACT standard shall not be more stringent than the control measures required for the same source category in a standard adopted under Article 11 or 40 C.F.R. Part 63. This stringency limitation shall include, but not be limited to, the following: If a standard promulgated under Article 11 or 40 C.F.R. Part 63 for an affected source does not impose control measures on certain HAP emissions from the affected source, then the Director shall not impose control measures under this Article on similar emissions from similar equipment or activities at a source subject to R18-2-1705(B).

R18-2-1707. Case-by-case AZMACT Determination.

**[IT IS PROPOSED THAT THIS SECTION BE REVISED TO PROVIDE THAT
AZMACT IS PROMULGATED BY RULE, UNLESS AN APPLICANT SEEKS A
VOLUNTARY CASE-BY-CASE MACT]**

- A. The applicant shall include in the application sufficient documentation to show that the proposed control technology meets the requirements of A.R.S. § 49-426.06 and this Section.
- B. An applicant subject to R18-2-1705(C) shall propose AZMACT for the new source or modification, to be included in the applicant's permit or permit revision. The applicant shall document each of the following steps:
 - 1. The applicant shall identify all available control options, taking into consideration the measures cited in R18-2-1701(6). This analysis shall include a survey of emission sources to determine the most stringent emission limitation currently achieved in practice in the United States. This survey may include technologies employed outside of the United States, and may include not only existing controls for the source category in question, but also, through technology transfer, controls applied to similar source categories and gas streams.
 - 2. The applicant shall eliminate options that are technically infeasible because of source-specific factors. A demonstration of technical infeasibility shall be clearly documented and shall be based upon physical, chemical and engineering barriers that would preclude the successful use of each control option that the applicant has eliminated.
 - 3. The applicant shall rank the remaining control technologies in order of overall removal efficiency for the HAP under review, with the most effective at the top of the list. The list shall include the following information, for the control technology proposed and for any control technology that is ranked higher than the proposed technology:
 - a. Estimated control efficiency, described by percent of HAP removed;
 - b. Expected emission rate in tons per year and pounds per hour;
 - c. Expected emission reduction in tons per year and pounds per hour;
 - d. Economic impacts and cost effectiveness;
 - e. Other environmental impacts; and
 - f. Energy impacts.
 - 4. The applicant shall evaluate the most effective controls and document the results as follows:

- a. For new sources, the applicant shall consider the factors described in subsection (B)(3) of this Section to arrive at the final control technology to be proposed as AZMACT.
 - i. The applicant shall discuss both beneficial and adverse impacts and, where possible, quantify them, focusing on the direct impacts of each control technology.
 - ii. If the applicant proposes the top alternative in the list as AZMACT, they shall consider whether the impacts in other media mandate the selection of an alternative control technology. If there are no such impacts, the evaluation is complete and the applicant shall propose the resulting control technology as AZMACT. If the top control technology is not proposed as AZMACT, the applicant shall similarly evaluate the next most stringent technology in the list. The applicant shall continue this process until the technology under consideration is not eliminated by any source-specific, economic, environmental or energy impacts.
 - b. For ~~modified sources~~ modifications, the applicant shall evaluate the control technologies as under subsection (B)(4)(a). AZMACT for ~~modified sources~~ modifications may be less stringent than AZMACT for new sources in the same source category but shall not be less stringent than:
 - i. In cases where the applicant has identified 30 or more sources, the average emission limitation achieved by the best performing 12% of the existing similar sources for which emissions data may be obtained; or
 - ii. In cases where the applicant has identified fewer than 30 similar sources, the average emission limitation achieved by the best performing five sources for which emissions data may be obtained.
5. The applicant shall propose AZMACT.
- a. The most effective control technology or methodology not eliminated in the evaluation described in subsection (B)(4) shall be proposed as AZMACT for the HAP under review.
 - b. The applicant may propose an innovative technology that reduces emissions for the HAP under review at least to the extent achieved by the control technology that would otherwise have been proposed and that meets all the requirements of A.R.S. § 49-426.06 and this Section.
- C. The control technology or methodology proposed shall not be less stringent than any applicable federal New Source Performance Standard (NSPS) at 40 CFR Part 60 or National Emission Standard for Hazardous Air Pollutants (NESHAP) at 40 CFR Part 61.

D. The Director shall determine whether the applicant's AZMACT proposal complies with A.R.S. § 49-426.06 and this Section, based on the documentation supplied.

1. If the Director finds that the applicant's proposal complies with A.R.S. § 49-426.06 and this Section, the applicant's proposed AZMACT selection shall be included in the permit or permit revision
2. If the Director finds that the applicant's proposal fails to comply with A.R.S. § 49-426.06 and this Section, the Director shall:
 - a. Notify the applicant that the proposal has failed to meet requirements;
 - b. Specify the deficiencies in the proposal; and
 - c. State that the applicant shall submit a new AZMACT proposal, in accordance with the provisions on licensing time frames in Chapter 1, Article 5 of this Title.
3. If the applicant does not submit a new proposal, the Director may deny the application for a permit or permit revision.
4. If the Director finds that the new proposal fails to comply with A.R.S. § 49-426.06 and this Section, the Director may deny the application for a permit or permit revision.

E. If a reliable method of measuring HAP emissions is not available, the Director shall require compliance with a design, equipment, work practice or operational standard, or combination of these, but shall not impose a numeric emissions limitation.

F. The Director shall not impose ~~a control technology~~ a standard under this section that would require the application of measures that are incompatible with measures required under Article 11 or 40 C.F.R. Part 63. An applicable control technology for a source or source category that is promulgated by the Administrator shall supersede control technology imposed by the Director for that source or source category.

G. The control measures required by an AZMACT standard shall not be more stringent than the control measures required for the same source category in a standard adopted under Article 11 or 40 C.F.R. Part 63. This stringency limitation shall include, but not be limited to, the following: If a standard promulgated under Article 11 or 40 C.F.R. Part 63 for an affected source does not impose control measures on certain HAP emissions from the affected source, then the Director shall not impose control measures under this Article on similar emissions from similar equipment or activities at a source subject to R18-2-1705(C).

R18-2-1708. Risk management analyses

A. Applicability

1. An applicant seeking to demonstrate that HAPRACT or AZMACT is not necessary to prevent adverse effects to human health or the environment from a new source or modification of an existing source shall conduct a risk management analysis (RMA) in accordance with this Section.
 2. An applicant seeking to demonstrate that HAPRACT or AZMACT is not necessary to prevent adverse effects to human health or the environment by conducting an RMA shall first apply for a permit or significant permit revision that complies with Article 3 of this Chapter. **CONSIDER ALTERNATIVES TO A SIGNIFICANT REVISION FOR TIERS 1-3**
 3. The RMA for a new source shall apply to its total potential to emit state HAPs.
 4. The RMA for a ~~modified source~~ modification of an existing source shall apply to ~~its~~ the modification's total potential to emit state HAPs ~~after the modification~~.
 5. An RMA shall be conducted for each state HAP emitted by the new source or modification in greater than de minimis amounts and that is not already subject to federal MACT, AZMACT, or HAPRACT. **CONSIDER USING A QUANTITY, SUCH AS 1.0 TPY, RATHER THAN DE MINIMIS AMOUNTS TO AVOID THE AUTHORITY GAP. SEE JOINT BUSINESS POSITION PAPER.**
- B. The applicant may use one or more of the following methods for determining potential maximum public exposure to state HAPs.
1. Tier 1: Equation.
 - a. For emissions of a HAPs included in a listed group of hazardous compounds, other than those HAPs identified in Table 3 as selected compounds, the applicant shall determine a health-based ambient air concentration, under subsection (C)(3).
 - b. The applicant shall determine the potential maximum hourly exposure resulting from emissions of the HAP by applying the following equation:

$$\text{MHE} = \text{PPH} * 17.68 \text{ [SOURCE OF THIS #?], where:}$$
 - i. MHE = maximum hourly exposure in milligrams per cubic meter, and
 - ii. PPH = hourly potential to emit the HAP in pounds per hour.
 - c. The applicant shall determine the potential maximum annual exposure resulting from emissions of the HAP by applying the following equation:

$$\text{MAE} = \text{PPY} * 1/\text{MOH} * 1.41 \text{ [SOURCE OF THIS #?], where:}$$

- i. MAE = maximum annual exposure in milligrams per cubic meter,
 - ii. PPY = annual potential to emit the HAP in pounds per year, and
 - iii. MOH = maximum operating hours for the source, taking into account any enforceable operational limitations.
 - d. The Director shall not require compliance with HAPRACT for the HAP, under R18-2-1706, or AZMACT, under R18-2-1707, if both of the following are true:
 - i. The maximum hourly concentration determined under subsection (B)(1)(b) is less than the AAAC determined under subsection (C)(3); and
 - ii. The maximum annual concentration determined under subsection (B)(1)(c) is less than the CAAC determined under subsection (C)(3).
 - e. If either the maximum hourly concentration determined under subsection (B)(1)(b), or the maximum annual concentration determined under subsection (B)(1)(c) is greater than or equal to the relevant AAC:
 - i. The Director shall require compliance with HAPRACT under R18-2-1706 or AZMACT under R18-2-1707; or
 - ii. The applicant may employ the Tier 2 method for conducting an RMA under subsection (B)(2).
2. Tier 2: SCREEN Model. The applicant shall employ the SCREEN Model, performed in a manner consistent with the Guideline specified in R18-2-406(A)(6)(a). The applicant shall compare the maximum concentration that is predicted to in the ambient air with the relevant ambient air concentration determined under subsection (C).

CONSIDER "GUIDELINE" ISSUES. IS THERE A 2005 GUIDELINE? FED. REG. A SHOWS ONLY 2003 EDITION. IS GUIDELINE APPROPRIATE FOR EXPOSURE MODELING? IS A CRITERIA POLLUTANT GUIDELINE APPROPRIATE FOR HAPS? ARE THERE OTHER OPTIONS? SEE JOINT BUSINESS RECOMMENDATIONS IN DR. RYAN'S COMMENTS.]

- a. If the predicted maximum concentration is less than the relevant ambient air concentration, the Director shall not require compliance with HAPRACT under R18-2-1706, or AZMACT under R18-2-1707.
- b. If the predicted maximum concentration is greater than or equal to the relevant ambient air concentration:

- i. The Director shall require compliance with HAPRACT under R18-2-1706, or AZMACT under R18-2-1707; or
 - ii. The applicant may employ the Tier 3 method for determining maximum public exposure to state HAPs, under subsection (B)(3).
- 3. Tier 3: Modified SCREEN Model. The applicant shall employ the SCREEN Model, performed in a manner consistent with the Guideline specified in R18-2-406(A). [SEE "GUIDELINE" ISSUES ABOVE]
 - a. For evaluation of acute exposure, the applicant shall assume exposure in the ambient air.
 - b. For evaluation of chronic exposure:
 - i. The applicant may use exposure assumptions consistent with institutional or engineering controls that are permanent and enforceable outside the permit.
 - ii. The applicant shall notify the Director of these controls. If the Director does not approve of the proposed controls, or if the controls are not permanent and enforceable outside of the permit, the applicant shall not use the method specified in subsection (B)(3)(b) to determine maximum public exposure to the state HAP.
 - c. If the predicted maximum concentration is less than the relevant ambient air concentration, the Director shall not require compliance with HAPRACT under R18-2-1706, or AZMACT under R18-2-1707.
 - d. If the predicted maximum concentration is greater than or equal to the relevant ambient air concentration:
 - i. The Director shall require compliance with HAPRACT under R18-2-1706, or AZMACT under R18-2-1707; or
 - ii. The applicant may employ the Tier 4 method for determining maximum public exposure to state HAPs, under subsection (B)(4).
- 4. Tier 4: Modified SCREEN or refined air quality model. The applicant shall employ either the SCREEN or a refined air quality model, performed in a manner consistent with the Guideline specified in R18-2-406(A) or an alternative approved pursuant to R18-2-406(b). [ALSO, SEE "GUIDELINE" ISSUES ABOVE]
 - a. ~~For evaluation of acute exposure, the applicant shall assume exposure in the ambient air.~~

- b. ~~For evaluation of chronic exposure:~~
 - i. ~~The applicant may use exposure assumptions consistent with institutional or engineering controls that are permanent and enforceable outside the permit.~~
 - ii. ~~The applicant shall notify the Director of these controls. If the Director does not approve of the proposed controls, or if the controls are not permanent and enforceable outside of the permit, the applicant shall assume chronic exposure in the ambient air.~~
- ea. The applicant may include in the Tier 4 RMA documentation of information relied upon the following factors, including but not limited to, the following if relied upon by the applicant:
 - i. The estimated actual exposure to the HAP of persons living in the airshed of the source;
 - ii. Available epidemiological or other health studies;
 - iii. Risks presented by background concentrations of hazardous air pollutants;
 - iv. Uncertainties in risk assessment methodology or other health assessment techniques;
 - v. Health or environmental consequences from efforts to reduce the risk; or
 - vi. The technological and commercial availability of control methods beyond those otherwise required for the source and the cost of such methods.
- db. The applicant ~~shall~~ may submit a written protocol for conducting an RMA, consistent with the requirements of this Section, to the Director for the Director's approval.
- ec. If the predicted maximum concentration is less than the relevant ambient air concentration, or if warranted in the Director's judgment by consideration of those factors listed in subsection (B)(4)(e) the applicant otherwise establishes that HAPRACT or AZMACT is not necessary to avoid adverse effects to human health or adverse environmental effects, the Director shall not require compliance with HAPRACT under R18-2-1706, or AZMACT under R18-2-1707.
- f. ~~Except as provided in subsection (B)(4)(e), if the predicted maximum concentration is greater than or equal to the relevant ambient air~~

concentration, the Director shall require compliance with HAPRACT under R18-2-1706, or AZMACT under R18-2-1707.

C. Health Based Ambient Air Concentrations of State HAPs.

1. For state HAPs for which an AAC has already been determined, the applicant shall use the acute and chronic values listed in Table 3.

Table 3. Acute and Chronic Ambient Air Concentrations
[DISAGREE – RECONSIDER
BASED ON EXPONENT’S PROPOSED METHODOLOGY]

Chemical	Acute AAC (mg/m ³)	Chronic AAC (mg/m ³)
1,1,1-Trichloroethane (Methyl Chloroform)	2,075	2.30E+00
1,1,2,2-Tetrachloroethane	18	3.27E-05
1,3-Butadiene	7,514	6.32E-05
1,4-Dichlorobenzene*	300	3.06E-04
2,2,4-Trimethylpentane	900	NA
2,4-Dinitrotoluene	5.0	2.13E-05
2-Chloroacetophenone	NA	3.13E-05
Acetaldehyde	306	8.62E-04
Acetophenone	25	3.65E-01
Acrolein	0.23	2.09E-05
Acrylonitrile	38	2.79E-05
Antimony Compounds (Selected compound: Antimony)	13**	1.46E-03
Arsenic Compounds (Selected compound: Arsenic)	2.5	4.41E-07
Benzene	1,276	2.43E-04
Benzyl Chloride	26	3.96E-05
Beryllium Compounds (Selected compound: Beryllium)	0.013**	7.90E-07
Biphenyl	38	1.83E-01
bis(2-Ethylhexyl) Phthalate	13**	4.80E-04
Bromoform	7.5	1.72E-03
Cadmium Compounds (Selected compound: Cadmium)	0.25	1.05E-06
Carbon Disulfide	311	7.30E-01
Carbon Tetrachloride	201	1.26E-04
Carbonyl Sulfide	30	NA
Chlorobenzene	1,000	1.04E+00
Chloroform	195	3.58E-04
Chromium Compounds (Selected	0.10	1.58E-07

compound: Hexavalent Chromium)		
Cobalt Compounds (Selected compound: Cobalt)	10	6.86E-07
Cumene	935	4.17E-01
Cyanide Compounds (Selected compound: Hydrogen Cyanide)	3.9	3.13E-03
Dibenzofurans	25	7.30E-03
Dichloromethane (Methylene Chloride)	347	4.03E-03
Dimethyl formamide	164	3.13E-02
Dimethyl Sulfate	0.31	NA
Ethyl Benzene	250	1.04E+00
Ethyl Chloride (Chloroethane)	1,250	1.04E+01
Ethylene Dibromide (Dibromoethane)	100	3.16E-06
Ethylene Dichloride (1,2-Dichloroethane)	405	7.29E-05
Ethylene glycol	50	4.17E-01
Ethylidene Dichloride (1,1-Dichloroethane)	6,250	5.21E-01
Formaldehyde	17	1.46E-04
Glycol Ethers (Selected compound: Diethylene glycol, monoethyl ether)	250	3.14E-03
Hexachlorobenzene	0.50	4.12E-06
Hexane	11,649	2.21E+00
Hydrochloric Acid	16	2.09E-02
Hydrogen Fluoride (Hydrofluoric Acid)	9.8**	1.46E-02
Isophorone	13**	2.09E+00
Manganese Compounds (Selected compound: Manganese)	2.5	5.21E-05
Mercury Compounds (Selected compound: Elemental Mercury)	1.0**	3.13E-04
Methanol	943	4.17E+00
Methyl Bromide	261	5.21E-03
Methyl Chloride	1,180	9.39E-02
Methyl Ethyl Ketone	5,015	5.21E+00
Methylhydrazine	0.43	3.96E-07
Methyl Isobutyl Ketone (Hexone)	500	3.13E+00
Methyl Methacrylate	311	7.30E-01
Methyl Tert-Butyl Ether	1,444	7.40E-03
N, N-Dimethylaniline	25	7.30E-03
Naphthalene	75	5.58E-05
Nickel Compounds (Selected compound: Nickel Refinery Dust)	5.0	7.90E-06

Phenol	58	2.09E-01
Polychlorinated Biphenyls (Selected Compound: Aroclor 1254)	2.5	1.90E-05
Polycyclic Organic Matter (Selected compound: Benzo(a)pyrene) 5.0	2.02E-06	
Propionaldehyde	403	8.62E-04
Propylene Dichloride*	250	4.17E-03
Selenium Compounds (Selected compound: Selenium) 0.50	1.83E-02	
Styrene	554	1.04E+00
Tetrachloroethylene (Perchloroethylene)	814	3.20E-04
Toluene	1,923	5.21E+00**
Trichloroethylene	1,450	1.68E-05
Vinyl Acetate	387	2.09E-01
Vinyl Chloride	2,099	2.15E-04
Vinylidene Chloride (1,2-Dichloroethylene) 38*	2.09E-01	
Xylene (Mixed Isomers)	1,736	1.04E-01

* [THESE NAMES ARE NOT IDENTICAL TO THOSE IN TABLE 1. PLEASE EXPLAIN.]

** [THESE VALUES APPEAR DIFFERENT THAN THOSE IN THE JUNE 7, 2005 AAC DOCUMENT. PLEASE EXPLAIN.]

2. For state HAPs for which an AAC has not already been determined, the applicant shall determine the acute and chronic AACs in accordance with the process in Appendix 12.
 3. For specific compounds included in state HAPS listed as a group (e.g., arsenic compounds), the applicant may use an AAC developed in accordance with the process in Appendix 12.
- D.** As part of the ~~r~~Risk ~~m~~Management ~~a~~Analysis, an applicant may voluntarily propose emissions limitations under R18-2-306.01 in order to avoid being subject to HAPRACT under R18-2-1706, or AZMACT under R18-2-1707.
- E.** Documentation of Risk Management Analysis. The applicant shall document each RMA performed for each state HAP and shall include the following information:
1. ~~The potential maximum public exposure of the state HAP~~The maximum concentration of the state HAP in the ambient air or at the local location of public human exposure;
 2. ~~The Tier method used to determine the potential maximum public exposure~~maximum concentration of the state HAP in the ambient air or at the local location of public human exposure;

- a. For Tier 1, the calculations demonstrating that the emissions of the state HAP are less than the health-based ambient air concentration, determined under subsection (C)(3).
 - b. For Tier 2, the input files to, and the results of the SCREEN Modeling.
 - c. For Tier 3:
 - i. The input files to, and the results of the SCREEN Modeling; and
 - ii. The permanent and enforceable institutional or engineering controls submitted to the Director under subsection (B)(3)(b).
 - d. For Tier 4:
 - i. The model the applicant employed;
 - ii. The input files to, and the results of the modeling;
 - iii. The modeling protocol ~~approved by the Director under subsection (B)(4)(b)employed;~~ and
 - iv. ~~The permanent and enforceable institutional or engineering controls submitted to the Director under subsection (B)(4)(d)Any~~ other information relied upon to make the demonstration;
 - 3. The health-based ambient air concentrations determined under subsection (C) and any alternative concentrations or exposure levels relied upon to make the demonstration; and
 - 4. Any voluntary emissions limitations, accepted under ~~subsection (D)~~ R18-2-306.01.
- G.** An applicant may conduct an RMA for any alternative operating scenario, requested in the application, consistent with the requirements of this Section.

R18-2-1709. Periodic review

- A.** Within one year after the Administrator adds or deletes a pollutant to the federal list of hazardous air pollutants, under Section 112(b)(2) or 112(b)(3) of the Clean Air Act or 40 C.F.R. Part 63, subpart C, the Director shall adopt those revisions for the state list of HAPs in R18-2-1703, ~~unless the Director finds that there is no scientific evidence to support the revision.~~
- B.** The Director shall review the state list of ~~HAPs~~ AACs at least once every three years.
- ~~C.~~ Based upon the review, or upon a petition pursuant to A.R.S. § 41-1033(A), the Director may revise by rulemaking:

1. ~~The state list of HAPs. The Director shall add any HAP to, or delete any HAP from, the state list at R18-2-1703, that has been added to or deleted from the federal list at § 112(b)(1) of the Clean Air Act, 42 U.S.C. 7412(b)(1);~~
2. The acute and chronic health based ambient air concentrations for state HAPs;
and.
3. ~~The acute and chronic de minimis levels for state HAPs.~~

**[DISAGREE WITH THIS METHODOLOGY;
RECONSIDER BASED ON EXPONENT'S METHODOLOGY]**

**A12. APPENDIX 12
PROCEDURES FOR DETERMINING AMBIENT AIR CONCENTRATIONS
FOR HAZARDOUS AIR POLLUTANTS**

A12.1. Solely for purposes of minor HAP source category listing decisions under A.R.S. § 49-426.05 and R18-2-1702(A)(1) and Risk Management Analyses under R18-2-1708, and for no other purpose, the procedure described in this section shall be used to develop chronic ambient air concentrations (CAACs) and acute ambient air concentrations (AAACs) for state hazardous air pollutants (HAPs) for the following
[REPLACE WITH EXPONENT'S METHODOLOGY]:

A12.1.1. Any HAP not included in Article 17, Table 3; and

A12.1.2. Any compound included in a group of HAPs listed in Article 17, Table 3, other than those identified in the group listing as the "selected" compound.

A12.2. Chronic Ambient Air Concentrations

A12.2.1. The following data sources shall be reviewed and, except as otherwise provided, shall be given the priority indicated in the development of CAACs:

A12.2.1.1. Tier 1 Data Sources: Reference Concentrations (RfCs) and air Unit Risk Factors (URFs) as presented in the Integrated Risk Information System (IRIS) of the United States Environmental Protection Agency (EPA).

A12.2.1.2. Tier 2 Data Sources:

A12.2.1.2.1. Preliminary Remediation Goals (PRGs) developed by Region 9 of EPA.

A12.2.1.2.2. Risk-Based Concentrations (RBCs) developed by Region 3 of EPA.

A12.2.1.3. Tier 3 Data Sources:

A12.2.1.3.1. Minimal Risk Levels (MRLs) developed by the Agency for Toxic Substances and Disease Registry (ATSDR).

A12.2.1.3.2. Reference Exposure Levels (RELs) and Unit Risk Factors (CalURFs) developed by the California Environmental Protection Agency.

A12.2.2. Evaluation of Tier 1 Values

A12.2.2.1. Calculation of Concentrations

A12.2.2.1.1. RfCs shall be adjusted by applying the following equation:

$$THQ \times (RfC \times IR/BW) \times BW \times ATn / (EF \times ED \times IR)$$

where: THQ = 1, IR = 20 m³/day, BW = 70 kg, ATn = 10,950 days,

EF = 350 days/year, ED = 30 years

A12.2.2.1.2. URFs shall be transformed into concentrations in milligrams per cubicmeter (mg/m³) by applying the following equation:

$$TR \times ATc / (EF \times IFA \text{ adj} \times [URF \times BW/IR])$$

where: TR = 1E-06, ATc = 25,550 days, EF = 350 days/year,

IFA adj = 11 m³-year/kg-day, BW = 70 kg, IR = 20 m³/day

A12.2.2.2. Comparison to Tier 2 and Tier 3 Concentrations

The concentration developed in accordance with section A12.2.2.1 above shall be compared to the Tier 2 and Tier 3 concentrations for the compound, if any. URFbased concentrations shall be compared only to concentrations based on CalURFs.

RfC-based concentrations shall be compared to concentrations based on PRGs, RBCs, MRLs and RELs.

A12.2.2.2.1. If there is reasonable agreement between the Tier 1 concentration and the other concentrations for the compound, the Tier 1 concentration shall be selected as the CAAC.

A12.2.2.2.2. If the Tier 1 concentration is not in reasonable agreement with the other concentrations, and one of the other concentrations is based on more recent or relevant studies, that concentration shall be selected as the CAAC. Otherwise the Tier 1 concentration shall be selected.

A12.2.2.3. If both an RfC-based and URF-based Tier 1 concentration is selected under section A12.2.2.2 above, the more stringent of the two shall be used as the CAAC.

A12.2.2.4. If a Tier 1 value is selected in accordance with this section, no further evaluation of Tier 2 or Tier 3 concentrations is required.

A12.2.3. Evaluation of Tier 2 Concentrations

A12.2.3.1. Selection of Tier 2 Values for Further Evaluation

A12.2.3.1.1. If there is only a PRG or RBC for the compound, it shall be selected for further evaluation in accordance with section A12.2.3.2 below.

A12.2.3.1.2. If there is both a PRG and an RBC for the compound, the concentrations shall be compared. If the concentrations are similar, the PRG shall be selected for further evaluation. If the concentrations are not similar, and the RBC is based on more relevant or more recent studies, it shall be selected for further evaluation. Otherwise the PRG shall be selected.

A12.2.3.2. Comparison to Tier 3 Concentrations

The concentration developed in accordance with section A12.2.3.1 above shall be compared to the Tier 3 concentrations for the compound, if any. For purposes of this comparison, only MRL- or REL-based concentrations shall be considered.

A12.2.3.2.1. If there is reasonable agreement between the Tier 2 concentration and the Tier 3 concentrations for the compound, the Tier 2 concentration shall be selected as the CAAC.

A12.2.3.2.2. If the Tier 2 concentration is not in reasonable agreement with the Tier 3 concentrations, and one of the Tier 3 concentrations is based on more recent or relevant studies, that concentration shall be selected as the CAAC. Otherwise the Tier 2 concentration shall be selected.

A12.2.3.3. If a Tier 2 concentration is selected in accordance with section A12.2.3, no further evaluation of Tier 3 concentrations is required.

A12.2.4. Evaluation of Tier 3 Values

A12.2.4.1. Calculation of Concentrations

A12.2.4.1.1. MRLs and RELs shall be adjusted by applying the following equation:

$$THQ \times (\text{Level} \times IR/BW) \times BW \times ATn / (EF \times ED \times IR)$$

where: THQ = 1, Level = the MRL or REL as appropriate, IR = 20 m³/day,

BW = 70 kg, ATn = 10,950 days, EF = 350 days/year, ED = 30 years

A12.2.4.1.2. CalURFs shall be transformed into concentrations in milligrams per cubic meter (mg/m³) by applying the following equation:

$$TR \times ATc / (EF \times IFA \text{ adj} \times [CalURF \times BW/IR])$$

where: TR = 1E-06, ATc = 25,550 days, EF = 350 days/year,

IFA adj = 11 m³-year/kg-day, BW = 70 kg, IR = 20 m³/day

A12.2.4.2. Selection of Concentration

A12.2.4.2.1. If both an MRL and an REL exist for the compound, the most appropriate shall be selected after considering the relevance and timing of the studies on which the levels are based.

A12.2.4.2.2. If there is both a CalURF-based concentration and a concentration based on an MRL or REL for the compound, the more stringent of the two shall be selected.

A12.2.5. No Available Data

If there is no data available in any of the sources identified in section A12.2.1 for the compound, the applicant must perform a Tier 4 Risk Management Analysis under R18-2-1708 or forego the Risk Management Analysis option.

A12.3. Acute Ambient Air Concentrations

A12.3.1. Selection of Concentration

The first concentration identified by evaluating the following data sources in the order listed shall be adjusted, where required, and used as the AAAC for the compound:

A12.3.1.1. The level 2, four-hour average Acute Exposure Guideline Level developed by the EPA Office of Prevention, Pesticides and Toxic Substances.

A12.3.1.2. The level 2 Emergency Response Planning Guideline (ERPG) developed by the American Industrial Hygiene Association. The AAAC shall be the ERPG divided by 2.

A12.3.1.3. The level 2 Temporary Emergency Exposure Limit (TEEL) developed by the United States Department of Energy's Emergency Management Advisory Committee's Subcommittee on Consequence Assessment and Protective Action. The AAAC shall be the TEEL divided by 2.

A12.3.2. No Available Data

If there is no data available in any of the sources identified in section A12.3.1, the applicant must perform a Tier 4 Risk Management Analysis under R18-2-1708 or forego the Risk Management Analysis option.

[MANY TERMS AND VALUES IN THIS APPENDIX LACK DEFINITIONS OR EXPLANATIONS]

R18-2-101. Definitions

98. "Regulated air pollutant" means any of the following:
- a.- Any conventional air pollutant as defined in A.R.S. § 49-401.01.
 - b. Nitrogen oxides and volatile organic compounds.
 - c. Any air contaminant that is subject to a standard contained in Article 9 of this Chapter.
 - d. Any state hazardous air pollutant as defined in Article 17 of this Chapter.
 - e. Any Class I or II substance listed in Section 602 of the Act.

R18-2-302. Applicability; Classes of Permits

- A. Except as otherwise provided in this Article, no person shall commence construction of, operate, or make a modification to any source subject to regulation under this Article, without obtaining a permit or permit revision from the Director.
- B. There shall be two classes of permits as follows:
- 1. A Class I permit shall be required for a person to commence construction of or operate any of the following:
 - a. Any major source,
 - b. Any solid waste incineration unit required to obtain a permit pursuant to Section 129(e) of the Act,
 - c. Any affected source, or
 - d. Any source in a source category designated by the Administrator pursuant to 40 CFR 70.3 and adopted by the Director by rule.
 - 2. Unless a Class I permit is required, a Class II permit shall be required for:
 - a. A person to commence construction of or operate any of the following:

- i. Any source, including an area source, subject to a standard, limitation, or other requirement under Section 111 of the Act;
- ii. Any source, including an area source, subject to a standard or other requirement under Section 112 of the Act, except that a source is not required to obtain a permit solely because it is subject to regulations or requirements under Section 112 (r) of the Act;
- iii. Any source that emits or has the potential to emit, without controls, significant quantities of regulated air pollutants;
- iv. Stationary rotating machinery of greater than 325 brake horsepower; or
- v. Fuel-burning equipment which, at a location or property other than a one or two family residence, is fired at a sustained rate of more than 1 million Btu per hour for more than an eight-hour period.
- b. A person to modify a source which would cause it to emit, or have the potential to emit, quantities of regulated air pollutants greater than or equal to those specified in subsection (B)(2)(a)(iii).
- c. A person to begin actual construction of a new source or a modification subject to Article 17 of this Chapter.
- ~~d. A person to make a modification subject to Article 17 of this Chapter to a source for which no permit has been issued under this Article.~~

C. Notwithstanding subsections (A) and (B), the following sources do not require a permit unless the source is a major source, or unless operation without a permit would result in a violation of the Act:

- 1. Sources subject to 40 CFR 60, Subpart AAA, Standards of Performance for New Residential Wood Heaters;
- 2. Sources and source categories that would be required to obtain a permit solely because they are subject to 40 CFR 61.145; and
- 3. Agricultural equipment used in normal farm operations. "Agricultural equipment used in normal farm operations" does not include equipment classified as a source that requires a permit under Title V of the Act, or that is subject to a standard under 40 CFR 60 or 61.

- D.** No person may construct or reconstruct any major source of hazardous air pollutants, unless the Director determines that maximum achievable control technology emission limitation (MACT) for new sources under Section 112 of the Act will be met. If MACT has not been established by the Administrator, such determination shall be made on a case-by-case basis pursuant to 40 CFR 63.40 through 63.44, as incorporated by reference in R18-2-1101(B). For purposes of this subsection, constructing and reconstructing a major source shall have the meaning prescribed in 40 CFR 63.41.

R18-2-304. Permit Application Processing Procedures

- A.** Unless otherwise noted, this Section applies to each source requiring a Class I or II permit or permit revision.
- B.** Standard Application Form and Required Information. To apply for any permit in this Chapter, applicants shall complete the "Standard Permit Application Form" and supply all information required by the "Filing Instructions" as shown in Appendix 1. The Director, either upon the Director's own initiative or on the request of a permit applicant, may waive a requirement that specific information or data be submitted in the application for a Class II permit for a particular source or category of sources if the Director determines that the information or data would be unnecessary to determine all of the following:
1. The applicable requirements to which the source may be subject;
 2. That the source is so designed, controlled, or equipped with such air pollution control equipment that it may be expected to operate without emitting or without causing to be emitted air contaminants in violation of the provisions of A.R.S. Title 49, Chapter 3, Article 2 and this Chapter;
 3. The fees to which the source may be subject;
 4. A proposed emission limitation, control, or other requirement that meets the requirements of R18-2-306.01.
- C.** Unless otherwise required by R18-2-303(B) through (D), a timely application is:
1. For a source, other than a major source, applying for a permit for the first time, one that is submitted within 12 months after the source becomes subject to the permit program.
 2. For purposes of permit renewal, a timely application is one that is submitted at least six months, but not more than 18 months, prior to the date of permit expiration.

3. For initial phase II acid rain permits under Title IV of the Act and regulations incorporated pursuant to R18-2-333, one that is submitted to the Director by January 1, 1996, for sulfur dioxide, and by January 1, 1998, for nitrogen oxides.
 4. Any source under R18-2-326(B)(3) which becomes subject to a standard promulgated by the Administrator pursuant to Section 112(d) of the Act shall, within 12 months of the date on which the standard is promulgated, submit an application for a permit revision demonstrating how the source will comply with the standard.
- D.** If an applicable implementation plan allows the determination of an alternative emission limit, a source may, in its application, propose an emission limit that is equivalent to the emission limit otherwise applicable to the source under the applicable implementation plan. The source shall also demonstrate that the equivalent limit is quantifiable, accountable, enforceable, and subject to replicable compliance determination procedures.
- E.** A complete application shall comply with all of the following:
1. To be complete, an application shall provide all information required by subsection (B) (standard application form section). An application for permit revision only need supply information related to the proposed change, unless the source's proposed permit revision will change the permit from a Class II permit to a Class I permit. A responsible official shall certify the submitted information consistent with subsection (H) (Certification of Truth, Accuracy, and Completeness).
 2. An application for a new permit or permit revision shall contain an assessment of the applicability of the requirements of Article 4 of this Chapter. If the applicant determines that the proposed new source is a major source as defined in R18-2-401, or the proposed permit revision constitutes a major modification as defined in R18-2-101, then the application shall comply with all applicable requirements of Article 4.
 3. An application for a new permit or a permit revision shall contain an assessment of the applicability of the requirements established under Article 17 of this Chapter. If the applicant determines that the proposed new source permit or permit revision is subject to the requirements of A.R.S. § 49-426.03 or § 49- 426.06 Article 17 of this Chapter, the application shall comply with all applicable requirements of that Article.
 4. Except for proposed new major sources or major modifications subject to the requirements of Article 4 of this Chapter, an application for a new

permit, a permit revision, or a permit renewal shall be deemed to be complete unless, within 60 days of receipt of the application, the Director notifies the applicant by certified mail that the application is not complete.

5. If a source wishes to voluntarily enter into an emissions limitation, control, or other requirement pursuant to R18-2-306.01, the source shall describe that emissions limitation, control, or other requirement in its application, along with proposed associated monitoring, recordkeeping, and reporting requirements necessary to demonstrate that the emissions limitation, control, or other requirement is permanent, quantifiable, and otherwise enforceable as a practical matter.
6. If, while processing an application that has been determined or deemed to be complete, the Director determines that additional information is necessary to evaluate or take final action on that application, the Director may request such information in writing, delivered by certified mail, and set a reasonable deadline for a response. Except for minor permit revisions as set forth in R18-2-319, a source's ability to continue operating without a permit, as set forth in this Article, shall be in effect from the date the application is determined to be complete until the final permit is issued, provided that the applicant submits any requested additional information by the deadline specified by the Director. If the Director notifies an applicant that its application is not complete under subsection (E)(4), the application may not be deemed automatically complete until an additional 60 days after receipt of the next submittal by the applicant. The Director may, after one submittal by the applicant pursuant to this subsection, reject an application that is determined to be still incomplete and shall notify the applicant of the decision by certified mail. After a rejection under this subsection, the Director may deny the permit or revoke an existing permit, as applicable.
7. The completeness determination shall not apply to revisions processed through the minor permit revision process.
8. Activities which are insignificant pursuant to R18-2-101(57) shall be listed in the application. The application need not provide emissions data regarding insignificant activities. If the Director determines that an activity listed as insignificant does not meet the requirements of R18-2-101(57), the Director shall notify the applicant in writing and specify additional information required.
9. If a permit applicant requests terms and conditions allowing for the trading of emission increases and decreases in the permitted facility solely for the purpose of complying with a federally enforceable emission cap that is established in the permit independent of otherwise applicable requirements, the permit applicant shall include in its application proposed

replicable procedures and permit terms that ensure the emissions trades are quantifiable and enforceable.

10. The Director is not in disagreement with a notice of confidentiality submitted with the application pursuant to A.R.S. § 49-432.
- F. A source applying for a Class I permit that has submitted information with an application under a claim of confidentiality pursuant to A.R.S. § 49-432 and R18-2-305 shall submit a copy of such information directly to the Administrator.
- G. **Duty to Supplement or Correct Application.** Any applicant who fails to submit any relevant facts or who has submitted incorrect information in a permit application shall, upon becoming aware of such failure or incorrect submittal, promptly submit such supplementary facts or corrected information. In addition, an applicant shall provide additional information as necessary to address any requirements that become applicable to the source after the date it filed a complete application but prior to release of a proposed permit.
- H. **Certification of Truth, Accuracy, and Completeness.** Any application form, report, or compliance certification submitted pursuant to this Chapter shall contain certification by a responsible official of truth, accuracy, and completeness. This certification and any other certification required under this Article shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.
- I. **Action on Application.**
1. The Director shall issue or deny each permit according to the provisions of A.R.S. § 49-427. The Director may issue a permit with a compliance schedule for a source that is not in compliance with all applicable requirements at the time of permit issuance.
 2. In addition, a permit may be issued, revised, or renewed only if all of the following conditions have been met:
 - a. The application received by the Director for a permit, permit revision, or permit renewal shall be complete according to subsection (E).
 - b. Except for revisions qualifying as administrative or minor under R18-2-318 and R18-2-319, all of the requirements for public notice and participation under R18-2-330 shall have been met.
 - c. For Class I permits, the Director shall have complied with the requirements of R18-2-307 for notifying and responding to

affected states, and if applicable, other notification requirements of R18-2-402(D)(2) and R18-2-410(C)(2).

- d. For Class I and II permits, the conditions of the permit shall require compliance with all applicable requirements.
 - e. For permits for which an application is required to be submitted to the Administrator under R18-2-307(A), and to which the Administrator has properly objected to its issuance in writing within 45 days of receipt of the proposed final permit and all necessary supporting information from the Department, the Director has revised and submitted a proposed final permit in response to the objection and EPA has not objected to this proposed final permit.
 - f. For permits to which the Administrator has objected to issuance pursuant to a petition filed under 40 CFR 70.8(d), the administrator's objection has been resolved.
 - g. For a Class II permit that contains voluntary emission limitations, controls, or other requirements established pursuant to R18-2-306.01, the Director shall have complied with the requirement of R18-2-306.01(C) to provide the Administrator with a copy of the proposed permit.
- 3. If the Director denies a permit under this Section, a notice shall be served on the applicant by certified mail, return receipt requested. The notice shall include a statement detailing the grounds for the denial and a statement that the permit applicant is entitled to a hearing.
 - 4. The Director shall provide a statement that sets forth the legal and factual basis for the proposed permit conditions including references to the applicable statutory or regulatory provisions. The Director shall send this statement to any person who requests it and, for Class I permits, to the Administrator.
 - 5. Except as provided in R18-2-303 and R18-2-402, regulations promulgated under Title IV or V of the Act, or the permitting of affected sources under the acid rain program pursuant to R18-2-333, the Director shall take final action on each permit application (and request for revision or renewal) within 18 months after receiving a complete application.
 - 6. Priority shall be given by the Director to taking action on applications for construction or modification submitted pursuant to Title I, Parts C

(Prevention of Significant Deterioration) and D (New Source Review) of the Act.

7. A proposed permit decision shall be published within nine months of receipt of a complete application and any additional information requested pursuant to subsection (E)(6) to process the application. The Director shall provide notice of the decision as provided in R18-2-330 and any public hearing shall be scheduled as expeditiously as possible.
- J. Requirement for a Permit. Except as noted under the provisions in R18-2-317 and R18-2-319, no source may operate after the time that it is required to submit a timely and complete application, except in compliance with a permit issued pursuant to this Chapter. However, if a source under R18-2-326(B)(3) submits a timely and complete application for continued operation under a permit revision or renewal, the source's failure to have a permit is not a violation of this Article until the Director takes final action on the application. This protection shall cease to apply if, subsequent to the completeness determination, the applicant fails to submit, by the deadline specified in writing by the Director, any additional information identified as being needed to process the application.

R18-2-306.02. Establishment of an Emissions Cap

[CONSIDER BIFURCATING PROVISIONS FOR EMISSIONS CAPS FOR CLASS I AND II SOURCES]

- A. An applicant may, in its application for a new permit, renewal of an existing permit, or as a significant permit revision, request an emissions cap for a ~~particular-regulated air~~ pollutant expressed in tons per year as determined on a 12-month rolling average, or any shorter averaging time necessary to enforce any applicable requirement, including that applicable to regulated hazardous air pollutants, for any emissions unit, combination of emissions units, or an entire source to allow operating flexibility including emissions trading for the purpose of complying with the cap. This Section shall not apply to sources that hold an authority to operate under a general permit pursuant to Article 5 of this Chapter.
- B. An emissions cap that limits the emissions of a particular pollutant for the entire source shall not exceed any of the following:
1. The applicable requirement for the pollutant if expressed in tons per year;
 2. The source's actual emissions plus the applicable significance level for the pollutant established in R18-2-101(104);
 3. The applicable major source threshold for the pollutant; or
 4. A sourcewide emission limitation for the pollutant voluntarily agreed to by the source under R18-2-306.01.
 5. If the cap is requested for purposes of Article 17, the emissions cap does not exceed the emission rate necessary to make the demonstration described in R18-2-1706.

- C. In order to incorporate an emissions cap in a permit the applicant must demonstrate to the Director that terms and conditions in the permit will:
1. Ensure compliance with all applicable requirements for the pollutant;
 2. Contain replicable procedures to ensure that the emissions cap is enforceable as a practical matter and emissions trading conducted under it is quantifiable and enforceable as a practical matter. For the purposes of this Section, "enforceable as a practical matter" shall include the following criteria:
 - a. The permit conditions are permanent and quantifiable;
 - b. The permit includes a legally enforceable obligation to comply;
 - c. The limits impose an objective and quantifiable operational or production limit or require the use of in-place air pollution control equipment;
 - d. The permit limits have short-term averaging times consistent with the averaging times of the applicable requirement;
 - e. The permit conditions are enforceable and are independent of any other applicable limitations; and
 - f. The permit conditions for monitoring, recordkeeping, and reporting requirements are sufficient to comply with R18-2-306(A)(3),(4), and (5).
 - ~~3. For a Class I permit, include all terms required under R18-2-306(A) and R18-2-309.~~
 3. If the cap is requested for purposes of Article 17, allow construction of new emissions units or reconstruction or modification of existing emissions units that would otherwise require preconstruction approval or operating permit revision, provided the actual emissions from the emissions units specified under an emissions cap or caps or to be included under the emissions cap or caps, do not exceed the emissions cap limit or limits.
 4. Allow for trading of emission increases and decreases solely for the purpose of complying with the emissions cap or caps, provided the permit contains adequate terms and conditions to determine compliance with the limit and with any emissions trading provisions.
- D. Class I sources shall log an increase or decrease in actual emissions authorized as a trade under an emissions cap unless an applicable requirement requires notice to the Director. The log shall contain the information required by the permit including, at a minimum, when the proposed emissions increase or decrease occurred, a description of the physical change or change in method of operation that produced the increase or decrease, the change in emissions from the physical change or change in method of operation, and how the increase or decrease in emissions complies with the permit. Class II sources shall comply with R18-2-317.02(B)(5).
- E. The owner or operator of a source that has obtained an emissions cap pursuant to this section may make changes under the emission cap limit that would otherwise require preapproval through a permit revision provided the Director receives

notification at least ten (10) days before beginning actual construction of each physical change or implementing each operational change. The notice shall:

1. Include the company name and address and source and permit identification numbers;
2. Describe the physical or operational change, including an estimate of the potential to emit the emissions associated with the change;
3. Identify on the layout diagram of the source what emissions unit or units the physical or operational change will affect;
4. Provide the schedule for constructing each physical change and implementing each operational change;
5. Identify any additional applicable requirements that are applicable to the physical or operational change and include any monitoring, record keeping, or reporting requirements to assure compliance with the applicable requirements;
6. Provide a statement for all regulated pollutants, except the pollutant for which the emissions cap limit has been established, that demonstrates that the physical or operational change will not trigger any Department permitting requirement for any regulated pollutant; and
7. Provide a statement that the physical or operational change will not result in emissions greater than the emissions cap limit or limits.

EF. The Director shall not include in an emissions cap or emissions trading allowed under a cap any emissions unit for which the emissions are not quantifiable or for which there are no replicable procedures or practical means to enforce emissions trades.

Historical Note

New Section adopted by final rulemaking at 5 A.A.R. 4074, effective September 22, 1999 (Supp. 99-3)

R18-2-406. Permit Requirements for Sources Located in Attainment and Unclassifiable Areas

- A. Except as provided in subsections (B) through (G) below and R18-2-408 (Innovative control technology), no permit or permit revision under this Article shall be issued to a person proposing to construct a new major source or make a major modification to a major source that would be constructed in an area designated as attainment or unclassifiable for any pollutant unless the source or modification meets the following conditions:
1. A new major source shall apply best available control technology (BACT) for each pollutant listed in R18-2-101(104)(a) for which the potential to emit is significant.
 2. A major modification shall apply BACT for each pollutant listed in R18-2-101(104)(a) for which the modification would result in a significant net emissions increase at the source. This requirement applies to each

proposed emissions unit at which a net emissions increase in the pollutant would occur as a result of a physical change or change in the method of operation in the unit.

3. For phased construction projects, the determination of BACT shall be reviewed and modified as appropriate at the latest reasonable time which occurs no later than 18 months prior to commencement of construction of each independent phase of the project. At such time the owner or operator of the applicable stationary source may be required to demonstrate the adequacy of any previous determination of best available control technology for the source.
4. BACT shall be determined on a case-by-case basis and may constitute application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment, clean fuels, or innovative fuel combustion techniques, for control of such pollutant. In no event shall such application of BACT result in emissions of any pollutant, which would exceed the emissions allowed by any applicable new source performance standard or national emission standard for hazardous air pollutants under Articles 9 and 11 of this Chapter. If the Director determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice, or operation and shall provide for compliance by means which achieve equivalent results.
5. The person applying for the permit or permit revision under this Article performs an air impact analysis and monitoring as specified in R18-2-407, and such analysis demonstrates that allowable emission increases from the proposed new major source or major modification, in conjunction with all other applicable emission increases or reductions, including secondary emissions, for all pollutants listed in R18-2-218(A), and including minor and mobile source emissions of oxides of nitrogen and PM₁₀:
 - a. Would not cause or contribute to an increase in concentrations of any pollutant by an amount in excess of any applicable maximum allowable increase over the baseline concentration in R18-2-218 for any attainment or unclassified area; or
 - b. Would not contribute to an increase in ambient concentrations for a pollutant by an amount in excess of the significance level for such pollutant in any adjacent area in which Arizona primary or

secondary ambient air quality standards for that pollutant are being violated. A new major source of volatile organic compounds or oxides of nitrogen, or a major modification to a major source of volatile organic compounds or oxides of nitrogen shall be presumed to contribute to violations of the Arizona ambient air quality standards for ozone if it will be located within 50 kilometers of a nonattainment area for ozone. The presumption may be rebutted for a new major source or major modification if it

can be satisfactorily demonstrated to the Director that emissions of volatile organic compounds or oxides of nitrogen from the new major source or major modification will not contribute to violations of the Arizona ambient air quality standards for ozone in adjacent nonattainment areas for ozone. Such a demonstration shall include a showing that topographical, meteorological, or other physical factors in the vicinity of the new major source or major modification are such that transport of volatile organic compounds emitted from the source are not expected to contribute to violations of the ozone standards in the adjacent nonattainment areas.

6. Air quality models:

- a. All estimates of ambient concentrations required under this Section shall be based on the applicable air quality models, data basis, and other requirements specified in 40 C.F.R. Pt. 51, Appendix W, "Guideline On Air Quality Models, as of July 1, 2005 (and no future amendments or editions), which shall be referred to hereinafter as "Guideline" and is adopted by reference and is on file with the Secretary of State and with the Department. [SEE COMMENTS ON "GUIDELINES" IN R18-2-1708]
- b. Where an air quality impact model specified in the "Guideline" is not applicable, the model may be modified or another model substituted. Such a change shall be subject to notice and opportunity for public comment. Written approval of the EPA Administrator shall be obtained for any modification or substitution.

- B. The requirements of this Section shall not apply to a new major source or major modification to a source with respect to a particular pollutant if the person applying for the permit or permit revision under this Article demonstrates that, as to that pollutant, the source or modification is located in an area designated as nonattainment for the pollutant.
- C. The requirements of this Section shall not apply to a new major source or major modification of a source if such source or modification would be a major source or major modification only if fugitive emissions, to the extent quantifiable, are

considered in calculating the potential emissions of the source or modification, and the source is not either among the Categorical Sources listed in R18-2-101 or belongs to the category of sources for which New Source Performance Standards under 40 CFR 60 or National Emission Standards for Hazardous Air Pollutants under 40 CFR 61 promulgated by the Administrator prior to August 7, 1980.

- D. The requirements of this Section shall not apply to a new major source or major modification to a source when the owner of such source is a nonprofit health or educational institution.
- E. The requirements of this Section shall not apply to a portable source which would otherwise be a new major source or major modification to an existing source if such portable source is temporary, is under a permit or permit revision under this Article, is in compliance with the conditions of that permit or permit revision under this Article, the emissions from the source will not impact a Class I area nor an area where an applicable increment is known to be violated, and reasonable notice is given to the Director prior to the relocation identifying the proposed new location and the probable duration of operation at the new location. Such notice shall be given to the Director not less than 10 calendar days in advance of the proposed relocation unless a different time duration is previously approved by the Director.
- F. Special rules applicable to Federal Land Managers:
 - 1. Notwithstanding any other provision of this Section, a Federal Land Manager may present to the Director a demonstration that the emissions attributed to such new major source or major modification to a source will have significant adverse impact on visibility or other specifically defined air quality related values of any Federal Mandatory area designated in R18-2-217(B) regardless of the fact that the change in air quality resulting from emissions attributable to such new major source or major modification to a source in existence will not cause or contribute to concentrations which exceed the maximum allowable increases for a Class I area. If the Director concurs with such demonstrations, the permit or permit revision under this Article shall be denied.
 - 2. If the owner or operator of a proposed new major source or a source for which major modification is proposed demonstrates to the Federal Land Manager that the emissions attributable to such major source or major modification will have no significant adverse impact on the visibility or other specifically defined air quality-related values of such areas and the Federal Land Manager so certifies to the Director, the Director may issue a permit or permit revision under this Article, notwithstanding the fact that the change in air quality resulting from emissions attributable to such new major source or major modification will cause or contribute to concentrations which exceed the maximum allowable increases for a Class

I area. Such a permit or permit revision under this Article shall require that such new major source or major modification comply with such emission limitations as may be necessary to assure that emissions will not cause increases in ambient concentrations greater than the following maximum allowable increases over baseline concentrations for such pollutants:

Maximum Allowable Increase
(Micrograms per cubic meter)

Sulfur Oxide

Period of exposure

Low terrain areas:

24-hour maximum 36

3-hour maximum 130

High terrain areas:

24-hour maximum 62

3-hour maximum 221

- G. The issuance of a permit or permit revision under this Article in accordance with this Section shall not relieve the owner or operator of the responsibility to comply fully with applicable provisions of the SIP and any other requirements under local, state, or federal law.
- H. At such time that a particular source or modification becomes a major source or major modification solely by virtue of a relaxation in any enforceable limitation which was established after August 7, 1980, on the capacity of the source or modification otherwise to emit a pollutant, such as a restriction on hours of operation, then the requirements of this Section shall apply to the source or modification as though construction had not yet commenced on the source or modification.

TAB 2

AMBIENT AIR CONCENTRATIONS



Technical Memorandum

Additional Comments on Arizona Department of Environmental Quality Ambient Air Criteria for Hazardous Air Pollutants

Prepared by
Exponent
15375 SE 30th Place, Suite 250
Bellevue, Washington 98007

October 2005

Additional Comments on ADEQ Ambient Air Criteria for Hazardous Air Pollutants

Exponent commented on the Arizona Department of Environmental Quality (ADEQ)'s proposed ambient air criteria (AACs) as described in two documents: *Arizona DEQ – Development of Acute Health-Based Ambient Air Criteria* (June 7, 2005) and *Arizona DEQ – Development of Chronic Ambient Air Concentrations (Long Term)* (April 22, 2005) (hereafter referred to as the Acute AAC and Chronic AAC documents). These comments were discussed during a teleconference held September 19, 2005, with ADEQ and their consultant, Weston Solutions. This memorandum provides additional comments and clarifications on deriving chronic AACs as follow up to that call.

We noted on the call that the derivation of the chronic AACs was inconsistent with the definition in the State statute regarding emissions that result in adverse effects, and that the scientific basis of many of the values was weak. ADEQ stated that their approach was to use values established by other agencies, such as U.S. EPA, State of California EPA, or Agency for Toxic Substances and Disease Registry (ATSDR), and they were unable to expend any more effort in evaluating the toxicity of AACs than outlined in the Chronic AAC document because of resource limitations. ADEQ also explained that they have determined that AACs for chemicals considered to be potentially carcinogenic by the U.S. EPA would be based on a risk level of 1 in a million.

In response to ADEQ's position, this memo provides (1) further comments on these issues and (2) suggestions for improvements in the methodology to derive chronic AACs, many of which would be relatively expedient, that will bring the methodology more in line with the definition in the applicable Arizona State statute and will ultimately result in a more practical statute with greater scientific basis.

Additional Comments on Consistency With the Statutory Language

According to the statute, a fundamental criterion for determining whether a source category should be listed is whether emissions of hazardous air pollutants (HAPs) "result in adverse effects to human health or adverse environmental effects" (A.R.S. §49-426.05, subsection A). In addition, for facilities that emit more than 1 ton per year of any one HAP, or 2.5 tons per year of any combination of HAPs but less than 10 tons per year of any one HAP, or 25 tons of any combination of HAPs, a determination as to whether Hazardous Air Pollutant Reasonable Available Control Technology (HAPRACT) should be required for a new or modified source depends on whether such control is necessary "to avoid adverse effects to human health or adverse environmental effects" (A.R.S. §49-426.06, subsection C). Similarly, the statute defines "adverse effects to human health" (A.R.S. §49-401.01, paragraph 2) as effects that "result in or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness, including adverse effects that are known to be or

may reasonably be anticipated to be caused....” This wording indicates a relatively high level of scientific evidence. We note that the statute does not say “could *potentially* result in adverse effect” or “to avoid *potential* adverse effects”; rather, the statute states “results in adverse effects” and “to avoid adverse effects.” However, ADEQ has noted that the definition of adverse effects includes the potential for effects, as indicated by a low cancer risk level or, for example, by animal studies. Specific comments are provided below on this issue for carcinogenic and non-carcinogenic chemicals.

Use of a Target Risk of 1×10^{-6} for Potential Carcinogens

ADEQ stated that a 1-in-a-million risk level goal is consistent with the Arizona State statute, because ADEQ believes that this level meets the statute definition of “**significantly contribute** to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness” (A.R.S. §49-401.01, paragraph 2; emphasis added). We have commented previously that this risk level does not appear to be warranted from a public health perspective and is inconsistent with the regulatory approach used by other agencies, including EPA and ADEQ, which also use a target risk range of one in a million to one in 10,000.

In lay usage, the word “significantly” is synonymous with words such as “substantially” or “considerably.” Scientifically, the word implies that one could statistically detect the contribution at a 95 percent confidence level. None of these definitions is consistent with a 1-in-a-million chance. For example, if a chance on the order of 1 in a million is “significant,” then buying a lottery ticket could be seen as significantly contributing to the chance of one becoming wealthy. Moreover, the risk of cancer is a hypothetical, not an actual chance, and as EPA and ATSDR have noted, the actual risk of cancer may be as low as zero (U.S. EPA 1986; ATSDR 2003). For many chemicals, the scientific data do not indicate they would actually cause cancer in humans at environmental exposure levels. This risk level thus cannot reasonably be considered to be consistent with “adverse effects to human health” **that result in or significantly contribute to** an increase in mortality, serious irreversible illness, or incapacitating reversible illness.

Although ADEQ noted that a low risk level was warranted because of additivity of other carcinogenic chemicals, the process already has a considerable margin built in from the many other worst-case assumptions that are used to estimate exposure, toxicity, and cancer risk.

Another indicator of the relatively low significance of a 1-in-a-million risk level is that the chronic AACs based on this risk level are, in several cases, similar to or less than typical ambient levels in cities, as we noted previously, including in Phoenix. The Arizona hazardous air pollution research program (ENSR 1995; Figure 4-9) also noted that dominant sources of HAP cancer risks in Phoenix were on-road motor vehicles (40 percent), lawn and garden equipment (35 percent), mobile equipment (6 percent), background (3 percent), aircraft (3 percent), construction dust (1 percent) swimming pools (1 percent) and off-road vehicles (1 percent). All other sources each contributed less than 1 percent.

For example, the annual average central tendency (50th percentile) and reasonable maximum exposure (95th percentile) levels (Table 4-2; ENSR 1995) for formaldehyde in Phoenix are

4 $\mu\text{g}/\text{m}^3$ and 7.7 $\mu\text{g}/\text{m}^3$, respectively, whereas the chronic AAC is 0.146 $\mu\text{g}/\text{m}^3$. Corresponding ambient levels for chloroform in Phoenix are 0.16 $\mu\text{g}/\text{m}^3$ and 0.45 $\mu\text{g}/\text{m}^3$, respectively, with a chronic AAC of 0.358 $\mu\text{g}/\text{m}^3$. Exposures near particular sources (e.g., inside buildings and swimming pools) would be even higher. If 0.146 $\mu\text{g}/\text{m}^3$ for formaldehyde and 0.358 $\mu\text{g}/\text{m}^3$ for chloroform are considered accurate for screening out levels that would result in adverse effects as defined by the State statute, then indoor exposures and swimming pools should receive more regulatory attention.

In reality, as stated in our previous comments, the scientific evidence does not support that formaldehyde or chloroform at environmentally relevant doses would cause cancer. We wish to clarify our comments on chloroform, given that we incorrectly stated in our previous comments that the AAC for chloroform was based on the EPA unit risk factor (URF). The chronic AAC for chloroform is actually based on the California URF; however, our previous point regarding the lack of evidence for cancer is still valid.

The California URF was derived more recently than the 1987 EPA inhalation slope factor and URF. Nevertheless, like EPA's URF, the URF is based on extrapolating risk from older studies involving high-dose oral administration in rodents. The draft chronic AAC for chloroform was based on the California EPA (OEHHA 2005a) inhalation slope factor of $1.9 \times 10^{-2} (\text{mg}/\text{kg}\cdot\text{day})^{-1}$ (unit risk of $5.3 \times 10^{-3} (\text{mg}/\text{m}^3)^{-1}$),¹ which was derived by the California Department of Health Services (CDHS 1990) using a non-threshold linear method applied to data from studies in which chloroform was administered orally to rats in drinking water (Jorgenson et al. 1985) and to rats and mice in corn oil (NCI 1976). The URF is the arithmetic average of unit risks derived by CDHS (1990) and Bogen et al. (1989) for renal tumors in male rats observed in Jorgenson et al. (1985) and in NCI (1976). The findings from these studies are somewhat inconsistent, in that NCI found liver cancers in male and female mice, but Jorgenson et al. (1985) did not find any increases in mouse liver cancers. Cal-EPA also notes that the selected unit risk value is consistent with the geometric mean for supporting data sets (two other studies from 1979 and 1985).

As we noted previously, EPA recognizes, in their Integrated Risk Information System (IRIS) record—the readily available source of toxicity information for risk assessments—that the mechanism by which chloroform causes cancer at high doses would not occur at lower doses. EPA posted clear cautionary statements that their inhalation slope factor was derived from an oral study from 1987, and that this slope factor does not include more recent data or EPA's current cancer risk guidelines. The IRIS record notes that cancer risk by the oral route is not a concern below a threshold for adverse non-cancer effects. Such a threshold for carcinogenicity has also been recognized by other panels in setting exposure levels, such as the Spacecraft Maximum Allowable Concentration (SMAC) for chloroform (NRC 2000).

The AAC for arsenic based on a 1-in-a-million risk of $4.4 \times 10^{-7} \text{ mg}/\text{m}^3$ ($4.4 \times 10^{-4} \mu\text{g}/\text{m}^3$) is also below the average level measured at the Phoenix residential neighborhood site of $2 \times 10^{-3} \mu\text{g}/\text{m}^3$

¹ Note, OEHHA (2005a) appears to have made a unit correction error in reporting the unit risk factor as $5.3 \times 10^{-6} (\mu\text{g}/\text{m}^3)^{-1}$.

(Table 4-2; ENSR 1995). Because arsenic is a naturally occurring element and the residential site in Phoenix would not be influenced by industrial sources, an AAC below these background levels seems unnecessarily low for screening out levels that would result in “adverse effects” or significantly contribute to an increase in mortality or serious irreversible effects.

Consistency of Endpoints Used as Basis for AACs with Statutory Language

ADEQ also noted that values such as EPA reference concentrations, preliminary remediation goals (PRGs) or doses used to derive these values, likewise constituted exposures, above which result in adverse effects as defined by the State statute. Our prior comments noted that many of these toxicity values are not based on adverse effects, or they contain numerous uncertainty factors such that the values are far from any level that would have such a significant contribution. For example, the chronic AAC for acetophenone is stated to be based on an oral reference dose (RfD) derived from data indicating “general toxicity” in rodents. Review of the EPA IRIS record for this chemical indicates that the RfD is actually based on a no-observed-adverse-effect level (NOAEL) at the highest dose tested. No effects were observed on growth, hematological parameters, or macro or microscopic tissue changes. Thus, the basis for this RfD does not appear to be “serious irreversible” or “incapacitating reversible illness.” Our prior comments also mistakenly identified an AAC for vanadium, which has an EPA oral RfD derived from a NOAEL for reduced hair cystine, as an additional example of toxicity data that are not representative of irreversible or incapacitating effects. While no AAC was derived for vanadium, it is still notable that the AAC derivation methodology adopts EPA toxicity values and PRGs with little evaluation of their basis. The regulatory framework and basis for EPA RfDs and reference concentrations (RfCs) also differ from that specified for the AACs, such that EPA values may not always be consistent with the State statute. If an AAC were needed for a chemical like vanadium, the process as identified would lead to such an inconsistent value.

Although vanadium was not in the draft AAC table, there are numerous examples of chemicals in the table that have this same issue. Another example not provided previously is the RfC for cumene, which is based on a NOAEL in a study where higher doses led to increased kidney and liver weights. Increased kidney and liver weights are a fairly non-specific effect and do not necessarily indicate serious irreversible effects. The RfC was derived through application of a 1000-fold uncertainty factor. Thus, the RfC for cumene is 1000 times lower than a level where no adverse effects occurred (U.S. EPA 2005).

Readily Available Alternative Toxicity Values

ADEQ has expressed concern for their lack of resources to do any more in evaluating the scientific basis of HAPs than is outlined in their chronic AAC document. This process starts with readily available air levels (e.g., RfCs, URFs, PRGs, reference exposure levels) derived by EPA, ATSDR, and Cal-EPA. As we noted previously, however, these levels may not reflect the current state of the science, even within each agency. Therefore, available values should not be used without determining whether those values are based on current science and are consistent

with the State statute. Ideally, this evaluation should include a review of all available literature regarding toxicity, including epidemiological literature, which may or may not have been considered in developing the EPA toxicity values. However, as discussed during our call, resources may not allow ADEQ to take on this level of review. Issues related to ADEQ's resources are beyond the scope of these comments, although the statutory criteria stand as requirements regardless of available resources. Nevertheless, understanding current limitations, we again urge that where there are readily available alternative toxicity values or data (e.g., in IRIS, ATSDR Toxicological Profiles, or other readily available information), they be considered as a basis for developing more technically sound AACs. As a part of this public comment process, scientific information (e.g., from the formaldehyde literature and from reviews conducted by EPA and Health Canada and the World Health Organization [WHO]—see previous comments) is also being provided that ADEQ could consider without expending much effort.

A few examples include:

1. Use of non-cancer endpoints for chloroform and formaldehyde, as discussed above and in previous comments.
2. Derivation of separate AACs for individual polycyclic aromatic hydrocarbons (PAHs). Although the federal HAPs list identifies PAHs as a group, the State statute does not prevent ADEQ from developing additional AACs and deriving AACs based on toxicity information for each of the PAHs with toxicity data that will provide a more robust means to evaluate PAH issues and risks (as noted in previous comments). Monitoring data in Arizona includes individual PAH compounds (ENSR 1995). In applying this approach, there is still considerable uncertainty related to the fact that only a few of the PAHs have inhalation-based toxicity values. At a minimum, non-carcinogenic PAHs should not be grouped with carcinogenic PAHs and represented by one of the most carcinogenic members of this group.
3. Distinguish among forms of metals that have widely varying toxicity. Previous comments noted this issue for chromium and arsenic. As an example for chromium, because the AAC derived for chromium compounds is actually based on the URF for hexavalent chromium [Cr(VI)], the technical accuracy of the AAC would be improved by eliminating the AAC for "chromium compounds" and applying this value to an AAC for Cr(VI) only.
4. If a slope-factor approach is used for trichloroethylene (TCE), this slope factor should be based on that derived by Cal-EPA rather than by EPA. As discussed with ADEQ, it is recognized that toxicity values are often in flux and undergoing review. However, the level of controversy and divergence regarding TCE is unusually high. In addition, the PRG for TCE (listed in the EPA Region 9 PRG table as based on an inhalation slope factor from NCEA) actually represents the upper end of the draft EPA range of values which is based on a particularly weak study for examining the dose-response effects of TCE: an epidemiological investigation of a population with oral exposure to TCE and other chemicals in drinking water (see our previous comments). Moreover, there is an

available reviewed and approved value based on inhalation data that has recently been re-verified by Cal-EPA (OEHHA 2002, 2005a,b). We again recommend that the slope factor derived by Cal-EPA, which is used in the Cal-EPA modified PRG, provides a more scientifically accurate basis for estimating inhalation cancer risks of TCE, because it was derived from inhalation studies and is more representative of health risks related to TCE (i.e., doesn't include exposures to other chemicals).

5. Do not use levels based on provisional values developed by EPA without evaluation of the underlying basis. As noted previously, these values have a much lower level of scientific review and are not readily available for open review and comment.
6. Incorporate some means for periodic updates of values. We note that since completing the draft Chronic AAC document, the EPA IRIS file for toluene has been revised to replace the RfC of 0.4 mg/m³ (used in the draft AAC) with a revised RfC of 5 mg/m³. Because the AACs are still draft, we recommend that the current IRIS value be used.

Although we recognize that values resulting from these recommendations may still contain considerable scientific uncertainty in some cases (e.g., animal-to-human and oral-to-inhalation extrapolations), these values represent a compromise between scientific accuracy and expediency in deriving AACs given resource limitations. It is beyond the scope of these comments to consider whether such a compromise is consistent with the statutory criteria.

Proposed Methodology for the Derivation of Chronic Ambient Air Concentrations

We present herein a flowchart (Figure 1) for deriving chronic AACs, to illustrate a process that is more consistent with the State statute and the current weight of scientific evidence.

Step 1. Information Review

The initial step is a review of the available toxicology and epidemiology literature. A more expedient approach would be to begin with the readily available summary documents on chemicals, such as those produced by ATSDR (toxicity profiles), EPA (IRIS record, toxicological support documents), American Conference of Governmental Industrial Hygienist (documentation of TLVs), National Research Council (NRC), Health Canada, and the WHO. A brief literature search may also reveal any recently published review articles. The review of this information includes identification of critical health-effect endpoints, particularly for humans, and any available toxicity values and their basis. Such values may include RfCs, URFs, or minimum risk levels and cancer effect levels derived by ATSDR, spacecraft maximum allowable concentrations (SMACs; NRC 2000), continuous exposure guideline levels (CEGLs) for submarines (NRC 2004), and threshold limit values (TLVs) of the American Conference of Governmental Industrial Hygienists (ACGIH). The latter three values (SMACs, CEGLs, and TLVs) are for astronauts, submariners, and workers, respectively. They do not include the general public and may assume shorter exposure durations; however, the documentation for

these levels typically includes considerable review and evaluation of the available human toxicity and epidemiology literature. Levels set for astronauts and submariners also assume 24-hour continuous exposures. Additional review of the database on humans is often included in the documentation of acute exposure guideline levels (AEGLs). Although these levels are set for acute exposures, the review of health effects, particularly for irritants, may also be relevant for chronic exposures.

Step 2. Exposure-Route Evaluation

Once data are assembled, a key issue is the availability of inhalation-based toxicity data or toxicity values. Where inhalation-based toxicity values are unavailable, oral toxicity data should be critically reviewed to determine whether they are representative of toxicity by inhalation. Because of the uncertainties in extrapolating between oral and inhalation routes, EPA has advised considerable caution with such extrapolations (see previous comments), and some state air programs (e.g., Texas) have advised against such extrapolations (TNRCC 1999). In addition, the EPA Office of Air Quality Planning and Standards discussion on application of risk assessments of hazardous air pollutants states: "We do not recommend oral-to-inhalation conversion for assessments that may lead to regulatory actions."

Review of Table 1 in the Chronic AAC document indicates that the toxicity benchmarks for a number of the chronic AACs are based on extrapolation from oral toxicity studies.² We also note that even when a slope factor or URF, for example, is listed by EPA (e.g., in PRG tables) as an inhalation value, this value could have been derived from an oral study in some cases (e.g., chloroform, TCE). Although disregarding the route of exposure results in more available toxicity values, application of toxicity values based on the oral route of administration is highly uncertain and may not be representative of inhalation risks. As stated previously, toxicity criteria based on extrapolation from oral studies should not be used to derive AACs, unless such an extrapolation can be scientifically justified. The appropriateness of carrying out route-to-route extrapolation should be determined on a case-by-case basis and must account for the relationship between physicochemical properties, the absorption and distribution of toxicants, the significance of portal-of-entry effects, and the potential differences in metabolic pathways associated with the intensity and duration of exposure. Other toxicity information, such as human inhalation exposure studies, should also be considered as an alternative to route-to-route extrapolation³.

² Examples include: acetophenone, antimony compounds, benzyl chloride, bisphenyl, bis (2-ethylhexyl) phthalate, bromoform, chloroform, dibenzofurans, N,N-dimethylaniline, 2,4-dinitrotoluene, ethylene dichloride, hexachlorobenzene, polychlorinated biphenyls, selenium compounds, 1,1,2,2-tetrachloroethane, and trichloroethylene. (This list has been corrected from our September 8, 2005 comments. Other oral to inhalation extrapolations may also be found if the basis of the AAC for each chemical in the chronic AAC document were investigated)

³ The chronic AAC for ethylene glycol was derived from a value based on inhalation studies in humans rather than a value based on oral feeding study in rats.

Step 3. Toxicity Value Comparison and Adjustment

Once potential toxicity values that can be used to represent inhalation toxicity are assembled, they should be reviewed to determine whether they are in reasonable agreement (this step is also included in Figure 1 of the draft AAC methodology). Where potential inhalation toxicity values are not in agreement, the following steps are recommended:

1. Evaluate the weight of evidence for each value: quality of study(ies) used to derive value, human vs. animal, mechanistic considerations, justification for uncertainty factors. The objective of this step is to identify the data with the strongest technical basis.
2. Once the weight-of-evidence step is completed, data should be reviewed to consider whether an adjustment (up or down) is needed to better represent the applicable exposure setting. In addition, some adjustment may be needed to be consistent with reasonable maximum exposure assumptions (such as used in the Chronic AAC document) or with the State statute. If an occupational-based toxicity value is identified (assuming that it is health-based) as the most relevant and appropriate standard, it may need to be adjusted to be protective of residential exposures. Any adjustments, however, should consider the underlying scientific data for specific chemicals in deciding the magnitude of such factors. For example, some chemicals may be more concentration dependent than time dependent and would not require large time adjustment factors (e.g., some irritants). Other chemicals may have robust data that indicate that the species tested was relatively more or less sensitive compared to humans, or that there is more or less variation in the human population for a certain endpoint. The EPA and various NRC committees currently incorporate such information in setting the magnitude of uncertainty factors, rather than using default factors of 10 for each source of uncertainty. Scientific data have indicated that a full factor of 10 is conservative for most sources of uncertainty, particularly for chemicals with a relatively complete database to assess such uncertainty (Dourson et al. 1996).
3. An evaluation should be conducted of whether a chemical, in fact, would cause cancer to humans at low doses. Information to consider includes epidemiological data, the nature of the tumors reported in animal studies, consistency among species and sexes, and mechanistic and genotoxicity evidence. If a full assessment is too onerous, then at a minimum, the evidence from recent reviews of other scientific panels and literature reviews should be considered. For those chemicals for which cancer at low doses cannot be ruled out, the URF should be adjusted to also consider an air concentration at a 10^{-4} risk level. This level is the upper limit of the typical acceptable risk range and is still well below risks that could actually be detected in a population, and thus is more in line with the statute's language. It should be recognized that this risk level still contains a considerable margin of safety because of the assumption of no-threshold, linear extrapolation of risk from high doses combined with worst-case exposure assumptions.

Step 4. Conduct Background Comparison

For some chemicals, it is possible that even a complete evaluation may result in a value in which considerable uncertainty adjustments are necessary, thereby potentially magnifying overestimation bias of toxicity and greatly underestimating the value for screening out exposures that would result in adverse effects in humans as defined by the statute. Thus, comparison to typical ambient levels is a means of ensuring that the resulting levels include some perspective from practical experience. The resulting toxicity value should be compared with available data for typical ambient (e.g., annual) non-point-source concentrations for the chemical. The resulting AAC should not be set lower than typical ambient concentrations.

Step 5. Select AAC

The final step involves the selection of the AAC value. Of the data available to derive an inhalation AAC, the selection should focus on the critical endpoints at lower doses that are consistent with screening out levels that would “result in or significantly contribute to an increase in mortality or increase in serious irreversible or incapacitating reversible illness.” If more than one value is well supported by the scientific evidence, the lowest value consistent with the statute language should be selected.

References

- ATSDR. 2003. Public Health Assessment, Eastern Surplus Company site, Meddybemps, Washington County, Maine. EPA Facility ID: MED981073711. Available at http://www.atsdr.cdc.gov/HAC/PHA/easternsurplus/esc_toc.html. Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation, Superfund Site Assessment Branch.
- Bogen, K.T., L.C. Hall, and T.E. McKone. 1989. Draft. Health risk assessment of chloroform in drinking water. Report No. UCRL - 21170. Lawrence Livermore National Laboratory, Environmental Sciences Division, Livermore, CA.
- CDHS. 1990. Health effects of chloroform. California Department of Health Services, Air Toxicology and Epidemiology Section, Office of Environmental Health Hazard Assessment, Berkeley, CA.
- Dourson, M.L., S.P. Felter, and D. Robinson. 1996. Evolution of science-based uncertainty factors in noncancer risk assessment. *Regul. Toxicol. Pharmacol.* 24:108–120.
- ENSR. 1995. Arizona hazardous air pollution research program. Final report. Volume 2: findings. Prepared for Arizona Department of Environmental Quality, Phoenix, AZ. ENSR Consulting and Engineering, Camarillo, CA.
- Jorgenson, T.A., E.F. Meierhenry, C.J. Rushbrook, R.J. Bull, and M. Robinson. 1985. Carcinogenicity of chloroform in drinking water to male Osborne-Mendel rats and female B6C3F1 mice. *Fundam. Appl. Toxicol.* 5:760–769.

NCI. 1976. Report on the carcinogenesis bioassay of chloroform. U.S. Department of Health, Education and Welfare, Public Health Service, National Institutes of Health, National Cancer Institute, Carcinogenesis Program, Division of Cancer Cause and Prevention.

NRC. 2000. Spacecraft maximum allowable concentrations for selected airborne contaminants. Volume 4. National Research Council, Commission on Life Sciences, Board on Environmental Studies and Toxicology, Committee on Toxicology, Subcommittee on Spacecraft Maximum Allowable Concentrations. The National Academies Press, Washington, DC.
<http://books.nap.edu/books/0309067952/html/2.html>

NRC. 2004. Emergency and continuous exposure guidance levels for selected submarine contaminants. Prepublication Copy. National Research Council of the National Academies, Division of Earth and Life Sciences, Board on Environmental Studies and Toxicology, Committee on Toxicology, Subcommittee on Emergency and Continuous Exposure Guidance Levels for Selected Submarine Contaminants. The National Academies Press, Washington DC.
<http://books.nap.edu/catalog/11170.html>

OEHHA. 2002. Air Toxics Hot Spots Program. Risk assessment guidelines. Part II: Technical support document for describing available cancer potency factors. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment: www.oehha.ca.gov/air/hot_spots/pdf/TSDNov2002.pdf.

OEHHA. 2005a. Air Toxics Hot Spots Program Risk assessment guidelines. Part II: Technical support document for describing available cancer potency factors. May. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Air Toxicology and Epidemiology Section.
http://www.oehha.ca.gov/air/hot_spots/pdf/may2005hotspots.pdf

OEHHA. 2005b. Toxic criteria database – cancer potency information: Trichloroethylene. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment:
www.oehha.ca.gov/risk/ChemicalDB/cancerpotency.asp?name=Trichloroethylene&number=79016.

TNRCC. 1999. Adoption preamble of Chapter 350–Texas Risk Reduction Program. Rule Log No. 96106-350-WS. Adopted September 2, 1999, effective September 23, 1999. Available at: <http://www.tceq.state.tx.us/assets/public/legal/rules/rules/pdflib/preamble.pdf>. Texas Natural Resource Conservation Commission.

U.S. EPA. 1986. Guidelines for carcinogen risk assessment. EPA/630/R-00/004. Available at http://www.epa.gov/ncea/raf/car2sab/guidelines_1986.pdf. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC.

U.S. EPA. 2005. Integrated Risk Information System (IRIS). U.S. Environmental Protection Agency. www.epa.gov/iris/search.htm.

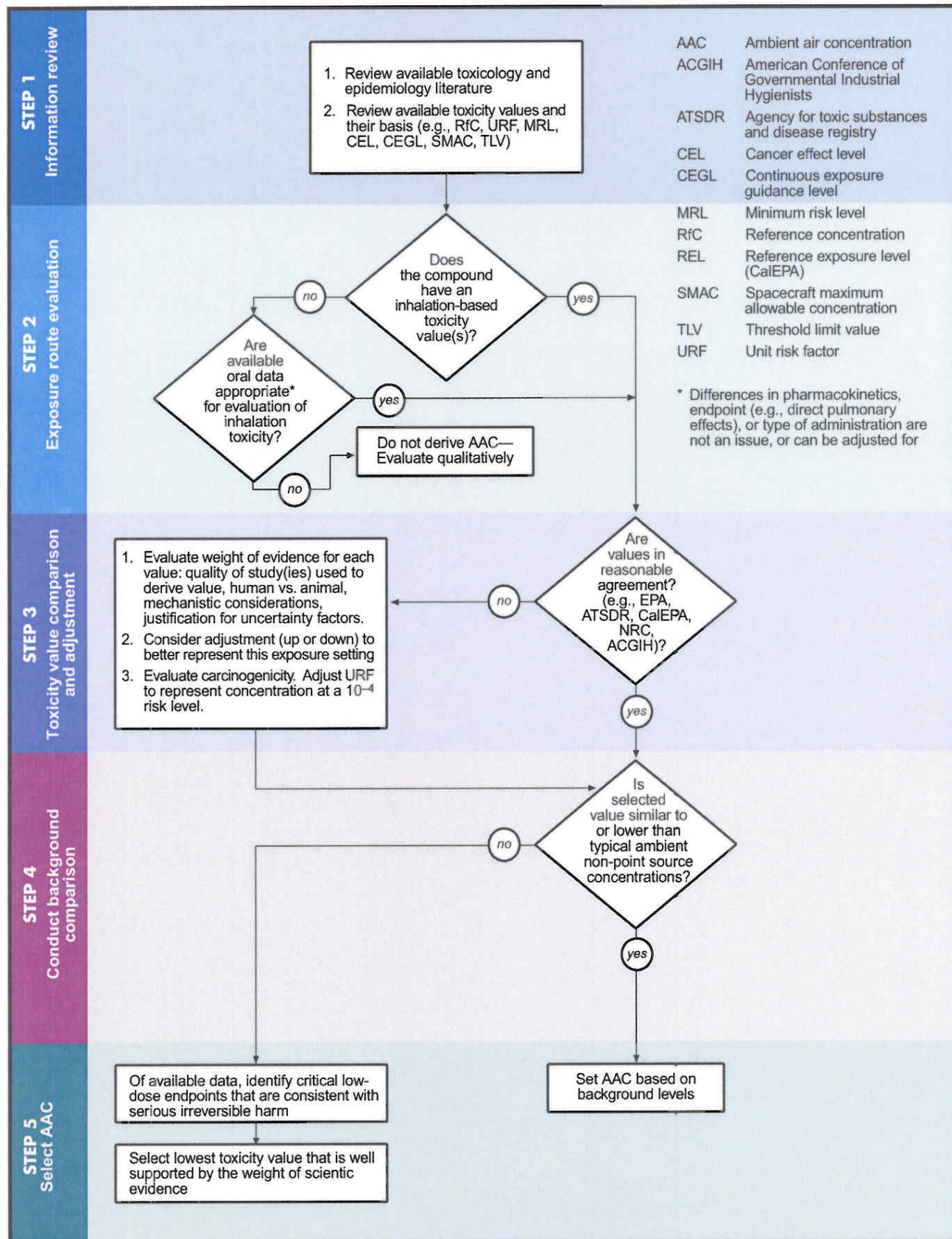


Figure 1. Flowchart for the selection of chronic ambient air concentrations

Table 1. Chronic air concentrations compared with typical air concentrations

Chemical	Proposed AAC	Typical Ambient Air Concentration	Ratio of Typical Air Concentrations to AAC	Notes on Typical Air Concentrations
Arsenic	4.41E-07 4.41E-07 4.41E-07	1.50E-06 4.20E-06 9.60E-06	3.4 10 22	CARB mean ATSDR outdoor air low mean Great Lakes urban ATSDR outdoor air high mean Great Lakes urban
Beryllium	7.90E-07	Undetectable at 3E-08	NA	ATSDR report that "most" EPA Storage and Retrieval of Aerometric Data Database Stations are undetectable
	7.90E-07 7.90E-07	2.00E-08 2.00E-06	0.03 2.5	ATSDR outdoor Detroit air low mean ATSDR outdoor Detroit air high mean
Benzene	2.43E-04 2.43E-04 2.43E-04	1.56E-02 1.14E-01 5.84E-03	64.1 467.7 24.1	ATSDR outdoor air low median ATSDR outdoor air high median ATSDR suburban outdoor air daily median
Cadmium	1.06E-06 1.06E-06 1.06E-06	1.00E-06 3.00E-06 4.00E-05	0.94 2.8 37.7	ATSDR outdoor air mean remote locations ATSDR outdoor urban air low mean ATSDR outdoor urban air high mean
Chromium	1.58E-07 1.58E-07 1.58E-07 1.58E-07	3.90E-06 1.20E-06 1.00E-05 3.00E-05	24.7 7.6 63.3 189.9	California (CARB) mean ATSDR chromium(VI) background mean rural New Jersey Total chromium - ATSDR outdoor urban air low Total chromium - ATSDR outdoor urban air high
Ethylene dichloride	7.29E-05 7.29E-05	Undetected 4.90E-05	NA 0.7	ATSDR outdoor rural, suburban air ATSDR outdoor urban air median
Formaldehyde ^a	3.16E-04 3.16E-04 3.16E-04 3.16E-04 3.16E-04	2.50E-03 1.00E-03 6.80E-02 7.60E-02 5.00E-02	7.9 3.2 215.2 240.5 158.2	ATSDR outdoor urban air median ATSDR outdoor rural and urban air low ATSDR outdoor rural and urban air high ATSDR indoor air newly constructed conventional ATSDR indoor - older conventional home high
TCE	1.68E-05 1.68E-05	2.51E-03 4.50E-03	149.5 268.0	ATSDR urban/suburban outdoor mean EPA background mean in indoor air

Note: Concentrations are reported in mg/m³.

ADEQ	- Arizona Department of Environmental Quality	EPA	- U.S. Environmental Protection Agency
ATSDR	- Agency for Toxic Substances and Disease Registry	NA	- not available
CARB	- California Air Resources Board		

^a Background levels from mobile homes were not included because the levels are considerably higher as a result of the homes' construction.



Technical Memorandum

Comments on Arizona Department of Environmental Quality Ambient Air Criteria for Hazardous Air Pollutants

Prepared for

The Arizona Mining Association

Prepared by

Exponent

15375 SE 30th Place, Suite 250

Bellevue, WA 98007

September 2005

Comments on Arizona Department of Environmental Quality Ambient Air Criteria for Hazardous Air Pollutants

As a part of their development of an air toxics program, the Arizona Department of Environmental Quality (ADEQ) has derived acute and chronic ambient air criteria (AACs) for use in source category listing, determining whether additional controls are necessary (e.g., hazardous air pollutant reasonable available control technology [HAPRACT]), and determining whether source modifications are *de minimis* for needing HAPRACT. The development of these AACs for federal hazardous air pollutants (HAPs) is described in two documents: *Arizona DEQ - Development of Acute Health-Based Ambient Air Criteria* (June 7, 2005) and *Arizona DEQ - Development of Chronic Ambient Air Concentrations (Long Term)* (April 22, 2005) (hereafter referred to as the Acute AAC and Chronic AAC documents). ADEQ has also released a related document describing how ambient air concentrations for facilities will be modeled for comparison to AACs: *Procedure for Ambient Air Quality Dispersion Modeling for the Arizona HAPRACT Rule* (July 5, 2005).

In response to ADEQ's request for stakeholder and public comment, Exponent is providing comments on the AACs. In general, the Acute and Chronic AAC documents reflect thoughtful consideration of existing methodologies for deriving health-based levels and applying them in the state air program. Our primary comment on the process for deriving AACs, as detailed in these two documents, is that the methodology for deriving chronic AACs, in particular, is inconsistent with the definition in the applicable Arizona State statute. Combined with very conservative, worst-case modeling assumptions, receptor location (25 m from the process area), and initial screening criterion for modeled concentrations (80% of the AAC), ADEQ's overall approach is expected to greatly overestimate actual risks of adverse effects, and the approach is inconsistent with applicable statutory language.

According to the statute, a fundamental criterion for determining whether a source category should be listed is whether emissions of hazardous air pollutants "result in adverse effects to human health or adverse effects to the environment" (49-426.05, subsection A). In addition, for facilities that emit more than 1 ton per year of any one HAP, or 2.5 tons per year of any

combination of HAPs but less than 10 tons per year of any one HAP, or 25 tons of any combination of HAPs, a determination as to whether HAPRACT should be required for a new or modified source depends on whether such control is necessary to avoid “adverse effects to human health or adverse environmental effects” (49-426.06, subsection C).

The State statute defines “adverse effects” as follows:

49-401.01, paragraph 2. “‘Adverse effects to human health’ means those effects that result in or significantly contribute to an **increase in mortality** or an **increase in serious irreversible or incapacitating reversible illness** [emphasis added], including adverse effects that are known to be or may reasonably be anticipated to be caused by substances that are acutely toxic, chronically toxic, carcinogenic, mutagenic, teratogenic, neurotoxic or causative of reproductive dysfunction.”

49-401.01, paragraph 3. “‘Adverse environmental effect’ means any significant and widespread adverse effect which may reasonably be anticipated on wildlife, aquatic life, or natural resources, including adverse impacts on populations of endangered or threatened species or significant degradation of environmental quality over broad areas.”

In addition, if ADEQ intends to use their methodology to derive AACs for use in developing a list of state HAPs, the following criteria will have to be met:

- 1) 49-426.04, subsection A, paragraph 1 (a). “There is scientifically reliable evidence on the health or environmental effects of the pollutant adequate to support the designation. The director shall rely on technical protocols appropriate for the development of the list of hazardous air pollutants and shall base the designation on credible medical and toxicological evidence that has been subject to peer review. **Evidence shall be considered scientifically reliable only if it demonstrates adverse effects to human health or adverse environmental effects from an air pollutant at concentrations that are likely to occur in the environment** [emphasis added] as a result of emissions of the pollutant into the ambient air.”

- 2) 49-426.04, subsection A, paragraph 1 (b). “Emissions, ambient concentrations, bioaccumulation or deposition of the **pollutant result in adverse effects to human health or adverse environmental effects**” [emphasis added].
- 3) 49-426.04, subsection A, paragraph 1 (c). “An adequate and reliable methodology exists for quantifying emissions and ambient concentrations of the pollutant.”

In the course of reviewing the approach used to develop health-based chronic AACs, a number of issues were identified. These issues, delineated below, should be addressed to ensure that the methodology reflects the best science and is consistent with the statutory language.

The basis for chronic ambient air concentrations is inconsistent with the applicable State statute

As already discussed, the statute indicates that concentrations must be based on “**adverse effects to human health**” that **result in or significantly contribute to** an increase in mortality, serious irreversible illness, or serious incapacitating reversible illness. The Acute AAC document acknowledges this definition in the introductory section, and the bases of the acute AACs (e.g., EPA Acute Exposure Guideline Level 2) are consistent with this definition. In contrast, the Chronic AAC document states that “Health based chronic ambient air criteria will be developed for individuals (including sensitive populations) to establish exposure levels to protect against serious health effects.” This definition of a chronic AAC is more consistent with that used to describe U.S. Environmental Protection Agency (EPA) reference doses (RfDs) and preliminary remediation goals (PRGs)—values that are set well below no-effects levels by a considerable margin. Because of the many conservative (i.e., tending to overestimate risk) assumptions that are built into these values, RfDs and PRGs often greatly overestimate the actual potential for health effects in humans. As such, these values are not intended to define levels above which adverse effects, as defined by the State statute, would result.

The derivation of the AACs in many cases also is inconsistent with the current scientific evidence for adverse health effects by inhalation. Many of the chronic AACs are based on

extrapolation from oral studies, even though it may not always be appropriate to do so (comments regarding limitations of route-to-route extrapolation follow). Some chronic AACs are based on extrapolation from high-dose laboratory animal data, even when data are available in humans at lower, more environmentally relevant dose levels. Still other chronic AACs are based on effects that are neither “irreversible” nor “incapacitating.”

As an example, the chronic AAC for acetophenone is based on an oral RfD, which in turn was derived based on “general toxicity” in rodents. Not only is the extrapolation based on oral toxicity data highly uncertain, but there was no effect in the study that served as the basis for the oral RfD that could be considered a serious irreversible or incapacitating effect. In fact, EPA’s Integrated Risk Information System (IRIS) database indicates that adverse effects were not observed even at the highest dose level of acetophenone tested (10,000 ppm in the diet); therefore, the highest dose level was considered a no-observed-adverse-effect level (NOAEL) and the RfD was set at a dose 3000 times lower than the NOAEL. As another example, the draft chronic AAC for vanadium is based on an oral RfD that was derived from a NOAEL for reduced hair cystine, which is neither a serious irreversible nor incapacitating effect, and the NOAEL was further reduced by an uncertainty factor of 100 to calculate the RfD. Acetophenone and vanadium are just two examples of chronic AACs that are inconsistent with the definition of adverse effects in the statute.

Recommendation: Toxicity criteria used to develop chronic AACs should be evaluated for scientific validity and consistency with the definition of adverse effects in the State statute. If these toxicity criteria do not meet the definition of “adverse effects,” as specified in the statute, the weight of scientific evidence should be considered, including relevant human data, to develop a more accurate value.

Toxicity criteria developed under other regulatory programs tend to overstate risks

Application of uncertainty/variability factors in developing the non-cancer toxicity criteria

The toxicity criteria developed for chronic non-cancer effects (e.g., RfCs, minimum risk levels [MRLs], Cal-EPA reference exposure levels [RELs]) are all derived using a similar methodology, which involves identifying the NOAEL or lowest-observed-adverse-effect level (LOAEL) in the most sensitive species and study. One of several uncertainty factors, generally 10-fold individually, is then applied to account for 1) the variation in sensitivity among members of the human population (intraspecies variability), 2) the uncertainty in extrapolating from animal data to humans (interspecies variability), 3) the uncertainty in extrapolating from data obtained in a study with less-than-lifetime exposure to lifetime exposure (e.g., extrapolating from subchronic to chronic exposure), 4) the uncertainty in extrapolating from a LOAEL to a NOAEL, and 5) the uncertainty associated with extrapolation from animal data when the database is incomplete. The combined uncertainty factor typically applied to derive the toxicity criteria ranges from 100 to 10,000. As a result of this practice, the toxicity criteria tend to greatly overestimate the actual likelihood of adverse effects and thus are typically well below any observed-effect levels based on scientific evidence. As discussed above, these types of levels are inconsistent with the statutory language concerning the levels that are to be used to determine the source category listing or whether a facility's emissions would produce adverse effects and therefore require HAPRACT.

In addition, although the Chronic AAC document implies that the AACs based on non-cancer effects were adjusted to a 30-year exposure period, no such adjustment is actually made because in the derivation equation the 30-year exposure period is divided by a 30-year averaging time thereby canceling out the 30-year adjustment. Because EPA RfCs and RfDs for example are protective for up to a lifetime of exposure, the resulting AACs assume lifetime exposure.

Recommendation: The toxicity criteria developed by EPA, the Agency for Toxic Substances and Disease Registry (ATSDR), or the State of California are not always consistent with the definition of adverse effects described in the Arizona statute, because they serve different goals. Therefore, ADEQ should evaluate each criterion in the context of the statute and, when appropriate, assess the scientific literature, including relevant studies in humans (e.g., epidemiological and occupational studies), to develop levels above which adverse effects would be likely to occur in humans.

Use of a target risk of 1×10^{-6} for carcinogens results in overly stringent chronic ambient air concentrations

Chronic AACs are particularly low for those chemicals that are considered to be potentially carcinogenic (a designation based primarily on high-dose studies in animals). These extremely low chronic AACs (often below background) result from both conservative, worst-case assumptions relied upon as a part of the dose-response modeling (e.g., the response at high doses in animals is similar to anticipated responses in humans; there is no threshold for the response; the route and method of dose administration in the animal study is relevant for humans), and an inappropriately low target risk level.

In developing their air toxics programs, ADEQ selected a target cancer risk level of one in a million (1×10^{-6}) as their point of departure for calculating chronic AACs for all carcinogens. This is an unnecessarily conservative approach, because this risk level represents the lower end of the acceptable target risk range of one in a million to one in 10,000, as defined by EPA and other regulatory agencies, including ADEQ. Recently, in their proposed soil remediation level guidance, ADEQ stated that the site-specific remediation levels would result in “a level of contaminants remaining in the soil after remediation which results in a cumulative excess lifetime cancer risk between 1×10^{-6} and 1×10^{-4} .”

Additionally, as already discussed, the statute indicates that concentrations must be based on “adverse effects to human health” **that result in or significantly contribute to an increase in mortality, serious irreversible illness, or incapacitating reversible illness.** However, the lower

end of the acceptable risk range (i.e., 1×10^{-6}) does not define the upper limit above which chemical levels might be considered to be associated with such “adverse effects.” Rather, the target risk level represents a policy decision regarding an acceptable level of excess risk. In fact, there is no scientifically reliable evidence that exposure to a chemical at a level associated with a target risk level of 1×10^{-6} would result in an increase in mortality, serious irreversible illness, or incapacitating reversible illness, consistent with the State statute. From a practical standpoint, even large epidemiological studies would have difficulty distinguishing an increased risk of even 1×10^{-4} . Furthermore, a risk as low as 1×10^{-6} , in combination with the many worst-case and unrealistic assumptions used to estimate the cancer risk, results in chronic AACs that are below typical ambient concentrations for some commonly occurring chemicals (e.g., trichloroethylene, polycyclic aromatic hydrocarbons, formaldehyde, arsenic).

Recommendation: Given the lack of statutory support for a specific target risk level, ADEQ should choose a value that meets the public health goals of the statute (i.e., regulating emissions that result in adverse effects to human health and the environment), yet does not result in unnecessary listings. Unnecessary listings would include emissions of chemicals that, upon conducting a site-specific risk management analysis, would never result in risks exceeding the acceptable target risk range of 1×10^{-6} to 1×10^{-4} . The proposed chronic AACs and modeling of exposure concentrations are based on generic assumptions, with a high likelihood of overestimating exposure and toxicity. As a result, even a target risk of 1×10^{-5} or 1×10^{-4} , in many cases, would likely not be found to be associated with unacceptable risks in a site-specific risk management analysis, particularly if the scientific basis of the AAC is evaluated as well. In reality, even with a risk management level set at 1×10^{-4} , actual risks would be far lower, because even site-specific risk assessments retain several conservative assumptions to ensure that exposure and toxicity are not underestimated. As such, ADEQ should consider adopting a more reasonable target cancer risk level.

Oral toxicity values may not be representative of inhalation risks

Review of Table 1 and associated footnotes in the Chronic AAC document indicates that the toxicity benchmarks for a number of the chronic AACs are based on an extrapolation from oral toxicity studies. Examples of specific HAPs whose toxicity benchmarks are based on extrapolation from oral studies include the following: acetophenone, antimony compounds, benzyl chloride, bis (2-ethylhexyl) phthalate, bromoform, chloroform, dibenzofurans, dichloromethane (methylene chloride), N,N-dimethylaniline, 2,4-dinitrotoluene, ethylene glycol, hexachlorobenzene, isophorone, methanol, phenol, polycyclic organic matter (surrogate-benzo(a)pyrene), polychlorinated biphenyls, selenium compounds, and 1,1,2,2-tetrachloroethane). Although it is reasonable to attempt to evaluate all chemicals regardless of the availability of inhalation toxicity values, application of toxicity values based on the oral route of administration is highly uncertain and may not be representative of inhalation risks. The state of the science clearly indicates that such extrapolation procedures ignore pharmacokinetic differences and are often scientifically invalid. In fact, several EPA guidance documents (e.g., U.S. EPA 1994, 1996), strongly discourage “across the board” route-to-route extrapolations like those done by EPA Regions 3 and 9 in developing their risk-based cleanup levels (RBCs) and preliminary remediation goals (PRGs). Route-to-route extrapolation can be highly uncertain and inaccurate when based exclusively on default assumptions regarding exposure and toxicokinetics, as done in developing the RBCs and PRGs.

For example, compared to inhalation exposure, oral exposure can result in either higher (i.e., administration of organic chemicals in a readily absorbed vehicle such as a solvent or corn oil) or lower absorption and toxicity (e.g., ingestion of elemental mercury). Oral administration studies are also inaccurate for characterizing inhalation toxicity when the lung is the site of injury. In addition, the active compound for many chemicals (e.g., chlorinated organic solvents) is often a metabolite that is produced in greatest amounts by the liver. Because of the first-pass effects, in which the liver receives absorbed substances directly from the gastrointestinal tract, intake via the oral route would result in a greater rate of metabolite formation and hence toxicity. This effect is most pronounced in oral dosing studies where chemicals are force fed in one bolus dose per day, rather than administered continuously as occurs with chronic inhalation

of a chemical in air or ingestion of a chemical in drinking water. Because chemicals are metabolized through different pathways, resulting in different metabolites depending on dose, bolus dosing may result in different effects and typically causes greater toxicity, particularly to the liver, than continuous administration.

Another example of a chronic AAC that is based on extrapolation from an oral study is antimony. In the study that serves as the basis of the inhalation toxicity value for antimony, rats were exposed to a single dose level of a soluble form of antimony administered in drinking water. No inhalation unit risk factor or RfC is available in the EPA IRIS file. Further, EPA has indicated that there is low confidence in the oral RfD. As such, use of the oral RfD as the basis for the chronic AAC is highly questionable. In contrast, however, EPA describes a study in a worker population exposed to antimony that suggests an inhalation NOAEL for myocardial damage of 0.5 mg/m^3 . The latter may be a more appropriate basis for derivation of an inhalation-based AAC.

In considering the issue of route extrapolation, the EPA Region 9 reference cited by the Chronic AAC document indicates that:

Route-to-route extrapolations ("r") were frequently used when there were no toxicity values available for a given route of exposure. Oral cancer slope factors ("SfO") and reference doses ("RfDo") were used for both oral and inhaled exposures for organic compounds lacking inhalation values. Inhalation slope factors ("SFi") and inhalation reference doses ("RfDi") were used for both inhaled and oral exposures for organic compounds lacking oral values. Route extrapolations were not performed for inorganics due to portal of entry effects and known differences in absorption efficiency for the two routes of exposure. EPA Region 9 concludes by stating that whenever route-to-route extrapolation is used to calculate risk-based PRGs, additional uncertainties are introduced in the calculation.

In the U.S. EPA (1994) guidance document titled, *Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry*, criteria have been

established to inform decision-making regarding the appropriateness of extrapolating from one route of exposure to another. The EPA guidelines indicate that oral data should not be used for route-to-route extrapolation if any of the following criteria are met:

1. When groups of chemicals are expected to have different toxicity by the two routes (e.g., metals, irritants, and sensitizers)
2. When a first-pass effect by the respiratory tract is expected
3. When a first-pass effect by the liver is expected
4. When a respiratory-tract effect is established, but dosimetry comparison cannot be clearly established between the two routes
5. When the respiratory tract was not adequately studied in the oral studies
6. When short-term inhalation studies, dermal irritation studies, *in vitro* studies, or characteristics of the chemical indicate a potential for portal-of-entry effects at the respiratory tract, but the studies themselves are not adequate for development of an RfC.

Recommendation: Toxicity criteria based on extrapolation from oral studies should not be used to derive AACs unless such an extrapolation can be scientifically justified. The appropriateness of carrying out route-to-route extrapolation should be determined on a case-by-case basis and must account for the relationship between physicochemical properties, the absorption and distribution of toxicants, the significance of portal-of-entry effects, and the potential differences in metabolic pathways associated with the intensity and duration of exposure. Other toxicity criteria, such as scientifically valid human inhalation exposure studies, should also be considered

Some toxicity criteria do not reflect the current state of the science

Some of the toxicity values available from EPA, ATSDR, and Cal-EPA may not reflect the current state of the science. Often, reviews and revisions are ongoing. Therefore, available values should not be used without determining whether those values are based on current science. For example, EPA recently indicated that the no-threshold, linear extrapolation of risk from high to low doses may not always be scientifically accurate, and that the mechanism of action of a chemical should be considered in assessing cancer risk. The examples below illustrate chemicals with AACs that are not based on the current state of the science or the most scientifically up-to-date regulatory values.

Example: Trichloroethylene

The chronic AAC for trichloroethylene (TCE) is based on the upper end of a range of slope factors identified by EPA in their draft 2001 reassessment. This draft TCE slope factor is based on an epidemiological investigation of a population with oral exposure to TCE and other chemicals in drinking water. The draft EPA reassessment of TCE is under extensive review within EPA, following substantial comments from the EPA Science Advisory Board. As a result of the considerable uncertainty associated with the draft EPA toxicity values for TCE, some regulatory agencies (e.g., the New York Department of Health¹ and Cal-EPA) have elected to use alternative values. The New York Department of Health (NYDOH) considered the dose-response data for both carcinogenic and non-carcinogenic effects of TCE to derive an air guideline of $5 \mu\text{g}/\text{m}^3$ for indoor air. NYDOH indicated that the study used by EPA to derive the upper-end provisional value did not provide an adequate basis for deriving a quantitative toxicity value. The Cal-EPA value is based on a group of inhalation studies that resulted in excess liver cancer in rodents. The Cal-EPA alternative toxicity value is identified in the EPA Region 9 PRG table as the "CAL modified PRG" of $9.6 \times 10^{-1} \mu\text{g}/\text{m}^3$ ($9.6 \times 10^{-4} \text{mg}/\text{m}^3$).

¹ http://www.health.state.ny.us/nysdoh/gas/svi_guidance/docs/kim_tceltr.pdf

Recommendation: The slope factor used by the CAL modified PRG provides a more scientifically accurate basis for estimating inhalation cancer risks of trichloroethylene, because it was derived from inhalation studies and is more representative of health risks related to TCE (i.e., doesn't include exposures to other chemicals). However, before basing the chronic AAC on cancer, a full evaluation should be conducted of the toxicological and epidemiological data for this chemical to determine whether extrapolation of cancer risk to low doses is consistent with the State statute.

Example: Formaldehyde

The chronic AAC for formaldehyde is based on a unit risk factor that was derived from high-dose studies in rodents. Such an approach is not justified, given the wealth of toxicology and epidemiology data in humans available from workplace, community, and controlled experimental studies (more than 22 experimental studies involving 500 individuals) as detailed in several recent comprehensive reviews (e.g., IARC 1995; Pasutenbach et al. 1997; ATSDR 1999; ACGIH 2001; Health Canada 2001; Bender 2002; WHO 2002; Liteplo and Meek 2003; NRC 2004).

The primary health effects associated with formaldehyde are related to the irritating and reactive properties of this highly water-soluble chemical. The most sensitive effects of formaldehyde at lower levels are thus related to irritation rather than cumulative systemic effects. Asthmatics are also not more sensitive at levels associated with upper respiratory irritation. In general, levels that do not produce short-term irritation also do not produce chronic irritation. Although exposures to concentrated formaldehyde solutions can result in allergic contact dermatitis, and inhalation of high airborne levels can result in bronchial spasms, a direct immunological basis for these reactions that is specific to formaldehyde appears to be lacking (IARC 1995; ATSDR 1999).

Based on controlled chamber studies, no difference in irritation effects is apparent between formaldehyde exposures around 0.5 ppm and below and clean air. A consistent dose-response relationship is more often observed at formaldehyde levels of around 1 ppm and above.

However, controlled chamber studies longer than 6 hours are unavailable. Less controlled studies, such as residential surveys and worker studies, provide supporting evidence, particularly for lower exposure levels and longer exposure times, but are of lower quality because of the lack of controls for many other factors that may underestimate the formaldehyde concentration associated with effects (e.g., background incidence of irritation, presence of other irritating chemicals, measurement accuracy both in terms of methodology and because peak exposure concentrations are often unmeasured or because air measurements were not taken at the time irritation was reported). Thus, although some of the less controlled studies indicate irritation at levels below 0.5 ppm, objective evidence is lacking that such effects would be caused by formaldehyde at these lower levels.

Consequently, despite all the human data for this chemical, a lower threshold for irritation in any and all persons for long-term exposures cannot be established by any one study, and such an exposure level would have to be based on a weight-of-evidence approach. The available human evidence indicates general concurrence in the literature, including occupational and community studies, that irritation effects would likely begin above 0.1 ppm, and that around this level, if any effects were to occur in sensitive people, these effects would be slight/mild and reversible, rather than annoying, and would certainly not be unbearable.

Formaldehyde has been considered to be carcinogenic via inhalation by EPA based on high-dose inhalation studies in animals (EPA IRIS record last revised in 1991). However, the weight of current scientific evidence indicates that cancers in rodents exposed repeatedly over time to high doses (e.g., typically 10–15 ppm) of formaldehyde occur by a mechanism that is irrelevant for low doses (i.e., cell necrosis and regenerative hyperplasia resulting in increased cell replication and thereby increased potential for malignant cells to occur). The primary concern for cancer is thus at doses that result in tissue damage. In humans, the overall evidence for cancer is inconsistent, and associations are relatively weak when statistically significant (IARC 1995; Collins et al. 1997; ATSDR 1999; Marsh et al. 2002; Coggon et al. 2003; Hauptmann et al. 2003, 2004; Pinkerton et al. 2004).

EPA is currently reviewing its unit risk factor for formaldehyde, which at present, is based on high-to-low-dose extrapolation from the animal data. Specifically, EPA is considering a biologically motivated, two-stage carcinogenicity model developed by CIIT (1999) that was externally peer reviewed by Health Canada and EPA (Health Canada and EPA 1998). This model results in different dose-response relationships at high doses versus low doses. At high doses, the model is driven primarily by cytotoxicity and regenerative hyperplasia, whereas at low doses, a much shallower slope is determined largely by genotoxicity data on formaldehyde, conservatively assuming that the risk of cancer is related to one marker of genotoxicity, DNA-protein cross-link formation, although this relationship has not been established.

Research and analysis related to CIIT (1999) is being published in separate papers (Connolly et al. 2003, 2004; Gaylor et al. 2004). The two-stage carcinogenicity model has been relied upon by WHO (2002) and Health Canada (2001) in their risk assessments of inhaled formaldehyde. Based on the results of this model, background air levels of formaldehyde would be associated with a risk well below one in a million. Continuous exposure to an air level as high as 0.3 ppm (the occupational exposure limit) is associated with a lifetime risk of 1 in 10 million in non-smokers and three in a million for smokers (CIIT 1999; NRC 2004). Connolly et al. (2004) conclude “that cancer risks associated with inhaled formaldehyde are de minimis (10^{-6} or less) at relevant human exposure levels, and (2) protection from the noncancer effects of formaldehyde should be sufficient to protect from its potential carcinogenic effects.” Clearly, chronic risks at low doses should be based on preventing irritation and related complications. Exposures that are protective of such effects would have a negligible risk of cancer.

Recommendation: Low-level environmental exposures with no significant irritation and irreversible changes in nasal mucosa would also be protective of cancer. This should be the focus for AAC development.

Example: Chloroform

The Chronic AAC document indicates that the AAC for chloroform is based on a unit risk factor (URF) of $2.3E-02$ available on IRIS. However, there is no such value currently available in

IRIS. In fact, IRIS no longer includes an inhalation URF for this compound. In 2001, EPA made a fundamental change in the way they assessed the carcinogenic risk for chloroform. In contrast to the traditional approach employed by EPA for deriving cancer potency values, wherein the response is assumed to be linear when extrapolating from the high doses in animal studies to the lower doses to which humans are likely to be exposed, EPA has now adopted a margin-of-exposure approach based on their new cancer risk guidelines. These guidelines allow recognition of the mode of action for carcinogenicity.

The available data indicate that chloroform is not strongly mutagenic and is not expected to produce rodent tumors via a mutagenic mode of action at low doses (ILSI 1997). The scientific literature indicates that the carcinogenic responses and tumor formation observed in animals are associated with regenerative hyperplasia (i.e., excess cellular multiplication and tissue growth) that occurs in response to cytolethality (killing of cells by direct high-dose toxicity; ILSI 1997; U.S. EPA 2001). Because cytolethality occurs only at exposure levels above some critical dose level, EPA has concluded that a nonlinear approach is the most appropriate method for characterizing the cancer risk from chloroform.

The EPA *Guidelines for Carcinogenic Risk Assessment* (U.S. EPA 2005a) discusses the interpretation of carcinogenicity data from studies where cancer is observed only following “excessive doses” and indicates that: “Studies that show tumor effects only at excessive doses may be compromised and may or may not carry weight depending on the interpretation in the context of other study results and other lines of evidence. Results of such studies, however, are generally not considered suitable for dose-response extrapolation if it is determined the mode(s) of action underlying the tumorigenic responses at high dose is not operative at lower doses.”² For chloroform, available evidence indicates that chloroform-induced carcinogenicity is secondary to cytotoxicity and regenerative hyperplasia. As such, U.S. EPA (2001) now relies on a nonlinear dose-response approach and margin-of-exposure analysis to characterize the cancer risk for ingested chloroform. Because the mode of action indicates that cytotoxicity is the critical effect, EPA has concluded that the RfD would be protective of both carcinogenic and

² <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=116283>

noncarcinogenic effects. EPA's assessment of the oral toxicity of chloroform was finalized in October of 2001 and is described in the IRIS database.

EPA has yet to derive an RfC, and the current EPA IRIS file does not include an inhalation value. The Chronic ACC appears to draw from the EPA Region 9 value, which is apparently the former oral unit risk factor based on liver cancer in mice resulting from administered chloroform by oral gavage (bolus dosing). As noted for the oral carcinogenicity and RfD assessment, the mechanism by which such cancer would occur (cytotoxicity) is not relevant for lower doses and would be even more inappropriate for evaluating inhalation exposures in which the first-pass effect through the liver would not occur.

Recommendation: Given the importance of the underlying toxicity criteria used to develop AACs, it is important that all values be verified as accurate according to the scientific literature. While the EPA Region 3 and Region 9 RBC and PRG tables still indicate that there is a URF available on IRIS for chloroform, these sources are out of date. Additionally, evidence of cancer at high doses, as indicated by cellular necrosis and regenerative hyperplasia, cannot be extrapolated to lower doses at which such effects would not occur. Several other chemicals have also been found to act by similar mechanisms at high doses (e.g., ethylene dibromide, formaldehyde). The validity of low-dose extrapolation of cancer risk for these chemicals should be evaluated as well.

Some of the chronic AACs are based on highly uncertain toxicity values

In some cases, the chronic AACs are based on provisional peer-reviewed toxicity values (identified as "PPRTVs" in the footnotes to Table 1 in the Chronic AAC document). These values, derived by EPA Superfund Technical Support Center staff, are not included in IRIS, and are not readily available for public review, but rather are provided to EPA Regional Risk Assessors for use in addressing chemicals detected at specific sites. The PPRTVs are not intended to be used broadly across programs. These values have not undergone a comprehensive peer-review, and many are highly uncertain. The PPRTVs are often based on a default route-to-route extrapolation and/or on surrogate data (i.e., data for another compound

that is believed to be structurally similar). Examples of chronic AACs that are based on these highly uncertain provisional toxicity values include cobalt compounds and 1,1,1-trichloroethane (methyl chloroform). In some cases, it may actually be more appropriate to evaluate toxicity values derived by other agencies (e.g., ATSDR, Cal-EPA), because these values are subjected to more extensive review and are typically are described in detailed background documents. As such, these toxicity values are likely to be more scientifically sound and transparent to the public and regulated entities.

Recommendation: ADEQ should review the scientific literature, including relevant human studies (e.g., occupational and epidemiological values) to determine whether the provisional toxicity values are scientifically sound and can be used in the desired application.

More information is needed concerning the flow chart for selection of chronic AACs (Figure 1 in the Chronic AAC document by ADEQ)

Figure 1 in the Chronic AAC document indicates that, for Tier 2, the chronic AACs based on EPA Region 3 RBCs or Region 9 PRGs are compared to other criteria (e.g., MRLs, Cal-EPA RELs) to determine if there is “reasonable agreement”. If there is not, then, as indicated in the flow chart, the next step is to review the basis of the criterion and then to select the most appropriate criterion. Given some of the limitations inherent in many of the RBCs and PRGs (e.g., default route-to-route extrapolations; inclusion of provisional toxicity values), this is clearly an important step. More information is needed to understand what constitutes “reasonable agreement,” as well as how the criterion was reviewed in cases where there was not reasonable agreement. For example, for cobalt compounds, the chronic AAC is based on the ambient air PRG of 6.86×10^{-7} from EPA Region 9. As indicated above, this ambient air PRG is based on a provisional toxicity value. In contrast, the ATSDR MRL is 1.04×10^{-4} , about three orders of magnitude less conservative than the PRG. This represents a substantial difference. Given these highly divergent numbers, it is critical that the chronic AAC selected is based on sound scientific rationale rather than always selecting one agency value over another without evaluation of the underlying scientific basis of each value.

Recommendation: ADEQ should provide more detailed information concerning how the criteria are reviewed, as well as describe the process for selecting the most appropriate value. Ideally, documentation should be provided for each individual HAP that is subject to such a review. This is critical if the process for establishing chronic AACs is to be completely transparent and open.

Several of the chronic health-based concentrations are below levels typically found in ambient air

A preliminary comparison of the chronic AACs to readily available background concentration data indicates that many of the AACs are within or below background air concentrations experienced by large population (urban) centers. Specifically, some of the chronic AACs are set at levels that are either near concentrations typically detected in background air, or are, in some cases, are nearly 400 times lower than background. Many of the substances with levels below background are based on the very stringent target cancer risk of one in a million. Metals occur naturally in soil, dust, and air. In urban settings, various sources (e.g., swimming pools, consumer products, building materials, automobiles, wood stoves) emit low-level, detectable concentrations of chemicals to indoor and outdoor air. Table 1 provides a comparison of the chronic AACs to concentrations in urban ambient air where no known source is present, as identified in reviews prepared by ATSDR. While these typical ambient air levels are variable, and it is uncertain how directly applicable they are for the regulated areas under consideration in Arizona, they do indicate that the chronic AACs are well below typical ambient concentrations in several cases. Consequently, it appears unreasonable to assume that serious irreversible effects would occur at levels below background levels, particularly for naturally occurring substances.

Recommendation: We recommend that, as a reality check, ADEQ compare all AACs to relevant background concentrations as a part of assessing whether the levels would define exposures above which adverse effects would occur, as defined by the State statute.

The worst-case surrogate compound is used to represent a group of related chemicals

Example: Chromium Compounds

The chronic AAC for chromium compounds is based on the URF for chromium (VI). EPA derived a Cr(VI) unit risk of $12 \text{ (mg/m}^3\text{)}^{-1}$ based on an elevated incidence of lung cancer in a cohort of Painesville, Ohio, chromate production workers who were exposed to soluble and insoluble chromium over many years in the workplace (U.S. EPA 2005b; Mancuso 1975, 1997). The Chronic AAC document, however, appears to imply that the chronic AAC of $1.58 \times 10^{-7} \text{ mg/m}^3$, calculated using the Cr(VI) unit risk factor, should be applied to total chromium. Although this is consistent with the approach taken by EPA Region 9 in calculating their ambient air PRG for total chromium, it is scientifically incorrect. EPA Region 9 also derives a Cr(VI) ambient air PRG by further adjusting the EPA unit risk by a factor of 7, under the assumption that the ratio of Cr(III) to Cr(VI) at the Painesville, Ohio, chromate production plant was 6:1, based on samples of soluble and insoluble total chromium. However, ample evidence suggests that not only is the EPA Region 9 adjustment in error, but the EPA slope factor actually overestimates Cr(VI) risk as well:

- Many researchers have questioned the reliability of the 6:1 ratio in the past (Proctor et al. 1999; Gibb and Chen 1986), and new data from the plant indicate clearly that this ratio is in error (Proctor et al. 2003). Mancuso (1975, 1997) measured water-soluble and acid-soluble chromium and assumed that the former was primarily Cr(VI) and the latter Cr(III). In fact, both Cr(III) and Cr(VI) can be present in water- or acid-soluble forms. Research conducted to reconstruct past Cr(VI) exposures experienced by the Mancuso (1975, 1997) cohort suggests that Cr(VI) concentrations identified in Mancuso (1975, 1997) likely represent lower-bound estimates (Proctor et al. 2003). Specifically, data compiled by Proctor et al. (2003) indicated higher Cr(VI) concentrations than had been determined previously for acid-soluble chromium in many of the plant areas. In fact, the chromium to which

many workers were exposed was almost 100% Cr(VI). The underestimation of the relative proportion of Cr(VI) would cause an overestimate of risk.

- The chromium concentrations used by Mancuso (1975, 1997) were collected in 1949, many years after actual exposures occurred in the 1930s. These concentrations likely underestimate the exposure levels actually experienced by the workers in the study. Newly identified data (Proctor et al. 2004) from the Painesville plant clearly indicate that exposures were higher prior to 1949, when the airborne chromium samples were collected. Record reviews and interviews with former workers support this assumption and indicate that exposures were likely higher during the 1930s when plant conditions were extremely dusty (Proctor et al. 2003). Underestimation of the dose in the relevant epidemiological study would have the effect of overestimating chromium risks (i.e., attribution of observed risks to a lower dose increases apparent toxicity).
- The Mancuso (1975, 1997) studies did not include information on smoking history. In the absence of smoking history data, EPA's analyses assumed that smoking prevalence was consistent with that of the general population. However, as EPA acknowledges in their Cr(VI) toxicology profile³, smoking prevalence is generally considered to be much higher within industrial cohorts. Given the clear contribution of smoking to lung cancer, and the apparent underestimate of smoking prevalence in the study population, lung cancer risk attributed to Cr(VI) exposure would thus be overestimated.

Based on a detailed analysis and subsequent reanalysis of the Mancuso (1975, 1997) studies by Proctor and colleagues (2003), it is clear that EPA Region 9's adjustment of the Cr(VI) unit risk is in error. The EPA unit risk of $12 \text{ (mg/m}^3\text{)}^{-1}$ is meant to be applied to Cr(VI), without adjustment, and in fact, likely overestimates Cr(VI) risk itself. Because total chromium could be 100% Cr(III), 100% Cr(VI), or any mixture in between, it is not meaningful to set a total chromium concentration based on an assumed ratio of the two in air. Furthermore, application

³ <http://www.epa.gov/iris/toxreviews/0144-tr.pdf>

of the 6:1 ratio has no basis. As discussed above, the assumed 6:1 ratio for workplace air in the Mancuso (1975, 1997) was likely an incorrect underestimate of relative Cr(VI) concentrations. In addition, even if one were to assume that the ratio was correct for the Painesville chromate plant, that ratio is irrelevant for ambient air.

Recommendation: Eliminate the proposed “chromium compounds” chronic ambient air concentration. Apply the proposed “chromium compounds” chronic ambient air concentration, based on the EPA unit risk of $12 \text{ (mg/m}^3\text{)}^{-1}$, to Cr(VI) only. Consider whether the epidemiological data would even support that cancer would result at low ambient levels. Do not derive an additional chronic ambient air concentration for Cr(III), because this essential element is relatively non-toxic, and there are inadequate data on the effects of inhaled Cr(III) (U.S. EPA 2005b).

Example: Polycyclic Organic Matter

The AAC for polycyclic organic matter (polycyclic aromatic hydrocarbons; PAHs) is based on the oral slope factor for the most carcinogenic member of this group, benzo[a]pyrene. However, not all of the PAH compounds are considered by EPA to be carcinogenic. Even for those with the potential to be carcinogenic based on animal studies, adjustment factors have been developed by EPA to reduce the benzo[a]pyrene slope factor for these less carcinogenic PAHs. For example, EPA Region 9 provides separate PRGs for each of the seven PAHs considered to be carcinogenic (benz[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, chrysene, dibenz[ah]anthracene, and indeno[1,2,3-cd]pyrene), as well as for six noncarcinogenic PAHs (acenaphthene, anthracene, fluoranthene, fluorene, naphthalene, and pyrene). The PAHs vary considerably in their toxicity, and as a result, the EPA Region 9 PRGs vary from the lowest PRG of $0.00092 \text{ } \mu\text{g/m}^3$ for the carcinogenic benzo[a]pyrene and dibenz[ah]anthracene to the highest value of $1095.0 \text{ } \mu\text{g/m}^3$ for anthracene, which was derived by EPA Region 9 based on the EPA oral RfD for anthracene. Therefore, considering all PAHs to be as carcinogenic as benzo[a]pyrene is not supported by the available scientific evidence, nor by the regulatory practices of other agencies. These regulatory examples are provided to demonstrate the lack of necessity to consider all PAHs to be as toxic as the worst-case surrogate.

Development of an AAC, of course, should consider the scientific data for each PAH compound, and take into account our previous comments on route-to-route and animal to human extrapolations and use of a low target cancer risk level.

Recommendation: Develop AACs for each PAH compound based on the scientific evidence for its specific toxicity. In applying this approach, there is still considerable uncertainty related to the fact that only one of the PAHs, naphthalene, has an inhalation-based toxicity value. The remaining PAHs are all based on oral toxicity values. Thus, the underlying oral toxicity data should be reviewed to assess whether route-to-route extrapolation may be justified for derivation of inhalation ACCs.

Example: Arsenic and Arsenic Compounds

Arsenic and arsenic compounds may include arsine gas, according to comments by ADEQ at a recent public and stakeholder meeting. However, arsine gas differs greatly in toxicity from particulate forms of arsenic. Arsine gas is more acutely toxic and causes different health effects (e.g., red blood cell hemolysis) than particulate arsenic compounds, but is not considered to be carcinogenic with chronic exposure. Even among arsenic compounds, lung cancer has been associated with high-dose exposures to arsenic trioxide in historical smelter workers but not with exposures to other forms of arsenic, such as sulfide forms in ore from mining.

Recommendation: Develop separate AACs for different arsenic forms based on the scientific weight of evidence supporting their toxicity.

References

- ACGIH. 2001. Formaldehyde. Documentation of the threshold limit values and biological exposure indices. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.
- ATSDR. 1999. Toxicological profile for formaldehyde. Agency for Toxic Substances and Disease Registry.
- Bender, J. 2002. The use of noncancer endpoints as a basis for establishing a reference concentration for formaldehyde. *Regul. Toxicol. Pharmacol.* 35:23–31.
- CIIT. 1999. Formaldehyde: Hazard characterization and dose-response assessment for carcinogenicity by the route of inhalation. Revised Edition. Chemical Industry Institute of Toxicology, Research Triangle Park, NC.
- Coggon, D., E.C. Harris, J. Poole, and K.T. Palmer. 2003. Extended follow-up of a cohort of British chemical workers exposed to formaldehyde. *J. Natl. Cancer Inst.* 95(21):1608–1615.
- Collins, J.J., J.F. Acquavella, and N.A. Esmen. 1997. An updated meta-analysis of formaldehyde exposure and upper respiratory tract cancers. *JOEM* 39(7):639–651.
- Conolly, R.B., J.S. Kimbell, D. Janszen, P.M. Schlosser, D. Kalisak, J. Preston, and F.J. Miller. 2003. Biologically motivated computational modeling of formaldehyde carcinogenicity in the F344 rat. *Toxicol. Sci.* 75:432–447.
- Conolly, R.B., J.S. Kimbell, D. Janszen, P.M. Schlosser, D. Kalisak, J. Preston, and F.J. Miller. 2004. Human respiratory tract cancer risks of inhaled formaldehyde: Dose-response predictions derived from biologically-motivated computational modeling of a combined rodent and human dataset. *Toxicol. Sci.* 82(1):279–296.
- Gaylor, D.W., W.K. Lutz, and R.B. Conolly. 2004. Statistical analysis of nonmonotonic dose-response relationships: Research design and analysis of nasal cell proliferation in rats exposed to formaldehyde. *Toxicol. Sci.* 77(1):158–164.
- Gibb, H. and C. Chen. 1986. Evaluation of issues relating to the carcinogen risk assessment of chromium. *Sci Total Environ.* 86:181–6.
- Hauptmann, M., J.H. Lubin, P.A. Stewart, R.B. Hayes, and A. Blair. 2003. Mortality from lymphohematopoietic malignancies among workers in formaldehyde industries. *J. Natl. Cancer Inst.* 95(21):1615–1623.
- Hauptman, M., J.H. Lubin, P.A. Stewart, R.B. Hayes, and A. Blair. 2004. Mortality from solid cancers among workers in formaldehyde industries. *Am. J. Epidemiol.* 159(12):1117–1130.

- Health Canada. 2001. Priority substances list assessment report—Formaldehyde. Canadian Environmental Protection Act, 1999. Environment Canada, Health Canada.
- Health Canada and EPA. 1998. Report presented at the External Peer Review Workshop on Formaldehyde, March 18-20, 1998, Ottawa, Canada. Health Canada and U.S. Environmental Protection Agency.
- IARC. 1995. IARC monographs on the evaluation of carcinogenic risks to humans. Volume 62. Wood dust and formaldehyde. World Health Organization, International Agency for Research on Cancer, Lyon, France.
- ILSI. 1997. An evaluation of EPA's proposed guidelines for carcinogen risk assessment using chloroform and dichloroacetate as case studies: Report of an expert panel. International Life Sciences Institute, Health and Environmental Sciences Institute, Washington, DC.
- Liteplo, R.G., and M.E. Meek. 2003. Inhaled formaldehyde: Exposure estimation, hazard characterization, and exposure-response analysis. *J. Toxicol. Environ. Health, Part B* 6:85-114.
- Mancuso, T.F. 1975. Consideration of chromium as an industrial carcinogen. International Conference on Heavy Metals in the Environment, Toronto, Ontario, Canada, October 27-31. pp. 343-356 (as reviewed by EPA 2005b).
- Mancuso, T.F. 1997. Chromium as an industrial carcinogen: Part 1. *Am J Ind Med* 31:129-139 (as reviewed by EPA 2005b).
- Marsh, G.M., A.O. Youk, J.M. Buchanich, L.D. Cassidy, L.J. Lucas, N.A. Esmen, and I.M. Gathuru. 2002. Pharyngeal cancer mortality among chemical plant workers exposed to formaldehyde. *Toxicol. Ind. Health* 18(6):257-268.
- NRC. 2004. Formaldehyde. Chapter 5 in Emergency and Continuous Exposure Guidance for Selected Submarine Contaminants. National Research Council of the National Academies, National Academies Press, Washington, DC.
- Paustenbach, D., Y. Alarie, T. Kulle, N. Schachter, R. Smith, J. Swenberg, H. Witschi, and S.B. Horowitz. 1997. A recommended occupational exposure limit for formaldehyde based on irritation. *J. Toxicol. Environ. Health* 50:217-263.
- Pinkerton, L.E., M.J. Hein, and L.T. Stayner. 2004. Mortality among a cohort of garment workers exposed to formaldehyde: An update. *Occup. Environ. Med.* 61:193-200.
- Proctor, D.M., J.M. Panko, B.L. Finley, W.J. Butler, and R.J. Barnhart. 1999. Need for improved science in standard setting for hexavalent chromium. *Regul. Toxicol. Pharmacol.* 29:99-101.

Proctor, D.M., J.P. Panko, E.W. Liebig, P.K. Scott, K.A. Mundt, M.A. Buczynsky, R.J. Barnhart, M.A. Harris, R.J. Morgan, and D.J. Paustenbach. 2003. Workplace airborne hexavalent chromium concentrations for the Painesville, Ohio, chromate production plant (1943-1971). *Appl. Occup. Environ. Hyg.* 18(6):430-449.

Proctor D.M., J.P. Panko, E.W. Liebig, and D.J. Paustenbach. 2004. Estimating historical occupational exposure to airborne hexavalent chromium in a chromate production plant: 1940-1972. *J Occup Environ Hyg.* 1(11):752-67.

U.S. EPA. 1994. Methods for derivation of inhalation reference concentrations and application of inhalation dosimetry. EPA/600/8-90/066F. U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC.

U.S. EPA. 1996. Soil screening guidance: Technical background document. Second Edition. EPA/540/R95/128. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC.

U.S. EPA. 2001. Toxicological Review of Chloroform. EPA/635/R-01/001. U.S. Environmental Protection Agency. Washington, D.C.

U.S. EPA. 2005a. Guidelines for carcinogen risk assessment. EPA/630/P-03/001F. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC.

U.S. EPA. 2005b. Integrated risk information system (IRIS). www.epa.gov/iris/search.htm. U.S. Environmental Protection Agency.

WHO. 2002. Concise international chemical assessment document 40. Formaldehyde. World Health Organization, Geneva, Switzerland.

Table 1. Chronic air concentrations compared with typical air concentrations

Chemical	Proposed AAC	Typical Ambient Air Concentration	Ratio of Typical Air Concentrations to AAC	Notes on Typical Air Concentrations
Arsenic	4.41E-07 4.41E-07 4.41E-07	1.50E-06 4.20E-06 9.60E-06	3.4 10 22	CARB mean ATSDR outdoor air low mean Great Lakes urban ATSDR outdoor air high mean Great Lakes urban
Beryllium	7.90E-07	Undetectable at 3E-08	NA	ATSDR report that "most" EPA Storage and Retrieval of Aerometric Data Database Stations are undetectable
	7.90E-07 7.90E-07	2.00E-08 2.00E-06	0.03 2.5	ATSDR outdoor Detroit air low mean ATSDR outdoor Detroit air high mean
Benzene	2.43E-04 2.43E-04 2.43E-04	1.56E-02 1.14E-01 5.84E-03	64.1 467.7 24.1	ATSDR outdoor air low median ATSDR outdoor air high median ATSDR suburban outdoor air daily median
Cadmium	1.06E-06 1.06E-06 1.06E-06	1.00E-06 3.00E-06 4.00E-05	0.94 2.8 37.7	ATSDR outdoor air mean remote locations ATSDR outdoor urban air low mean ATSDR outdoor urban air high mean
Chromium	1.58E-07 1.58E-07 1.58E-07 1.58E-07	3.90E-06 1.20E-06 1.00E-05 3.00E-05	24.7 7.6 63.3 189.9	California (CARB) mean ATSDR chromium(VI) background mean rural New Jersey Total chromium - ATSDR outdoor urban air low Total chromium - ATSDR outdoor urban air high
Ethylene dichloride	7.29E-05 7.29E-05	Undetected 4.90E-05	NA 0.7	ATSDR outdoor rural, suburban air ATSDR outdoor urban air median
Formaldehyde ^a	3.16E-04 3.16E-04 3.16E-04 3.16E-04 3.16E-04	2.50E-03 1.00E-03 6.80E-02 7.60E-02 5.00E-02	7.9 3.2 215.2 240.5 158.2	ATSDR outdoor urban air median ATSDR outdoor rural and urban air low ATSDR outdoor rural and urban air high ATSDR indoor air newly constructed conventional ATSDR indoor - older conventional home high
TCE	1.68E-05 1.68E-05	2.51E-03 4.50E-03	149.5 268.0	ATSDR urban/suburban outdoor mean EPA background mean in indoor air

Note: Concentrations are reported in mg/m³.

ADEQ	- Arizona Department of Environmental Quality	EPA	- U.S. Environmental Protection Agency
ATSDR	- Agency for Toxic Substances and Disease Registry	NA	- not available
CARB	- California Air Resources Board		

^a Background levels from mobile homes were not included because the levels are considerably higher as a result of the homes' construction.

TAB 3

AMBIENT AIR BOUNDARY

**ADEQ'S USE OF "PROCESS AREA BOUNDARY" TO CALCULATE
AMBIENT AIR CONCENTRATIONS IS CONTRARY TO LAW AND
SHOULD NOT APPLY TO THE RISK MANAGEMENT ANALYSIS**

In its methodology for air quality dispersion modeling, which is used to list source categories under the proposed HAPRACT rules and is an element in ADEQ's proposed Risk Management Analysis procedure, ADEQ defines the ambient air boundary as the "process area boundary." This approach is used regardless of whether the general public actually has access to a facility's process area. In so doing, ADEQ violates its own regulatory definition of "ambient air."

"Ambient air" is defined by both ADEQ and EPA as "that portion of the atmosphere, external to buildings, to which the general public has access." A.A.C. R18-2-101(12); 40 C.F.R. § 50.1(e) (emphasis added).

ADEQ's position that a plant's process area boundary is where ambient air begins, even if the public is physically denied access, by a barrier, fence or other physical obstruction to a much larger area of plant property, is inconsistent with the plain meaning of ADEQ's regulatory definition of ambient air. It is also inconsistent with the interpretation given the term "ambient air" in twenty-five years of EPA rulings and guidance documents and contradicts the meaning of ambient air consistently applied in every other jurisdiction.

Under EPA's Guidance, Property Inside a Fence or Other Barrier, Including an Active Barrier, Is Not Considered "Ambient Air."

There is extensive EPA analysis as to what is meant by the phrase "that portion of the atmosphere, external to buildings, to which the general public has access," as ambient air is defined by EPA and in the ADEQ rules.

EPA has interpreted the phrase "to which the general public has access" as meaning "property which members of the community at large are not physically barred in some way from entering." See Memorandum from Michael A. James, Air Quality and Radiation Division, to Jack R. Farmer, Chief Plans Management Branch (September 28, 1972). EPA Office of General Counsel has stated:

[The definition of ambient air], in our view, limits the standards' applicability to the atmosphere outside the fenceline, since "access" is the ability to enter. In other words, areas of private property to which the owner or lessee has not restricted access by physical means such as a fence, wall, or other barrier can be trespassed upon by members of the community at large. Such persons, whether they are knowing or innocent trespassers, will be exposed to and breath the air above the property.

Thus, a physical barrier, such as a fence or wall, satisfies the test for determining if public access is effectively precluded for purposes of defining ambient air. See also Memorandum from Walter C. Barber, Director, Officer of Air Quality Planning and Standards, to Gordon M. Rapier,

Director, Air and Hazardous Materials Division Region II (May 23, 1977); New Source Review Workshop Manual (October 1990) at C.42 (“Public access to plant property is to be assumed . . . unless a continuous physical barrier, such as a fence or wall, precludes entrance onto that property.”). If the plant is fenced, EPA does not consider the property within the fenceline to be ambient air. See Memorandum from G.T. Helms, Chief, Control Programs Operations Branch, to Steven Rothblatt, Chief Air Branch, Region V (April 30, 1987).

In addition to fencelines, natural barriers or “other” unfenced boundaries may also be sufficient to preclude public access. EPA has found natural physical barriers – combined with signs and regular patrolling – to be sufficient to limit public access. For example, EPA has stated that a riverbank can form a sufficient natural barrier such that fencing is not necessary. See Memorandum from G.T. Helms, Chief, Control Programs Operations Branch, to Steven Rothblatt, Chief Air Branch, Region V (April 30, 1987). The riverbank, however, must be clearly posted and regularly patrolled by plant security. In other words, it must be very clear that the area is not public. In an example, EPA has found that the operator of the Kennecott smelter in Magma, Utah had effectively precluded public access from its property by a series of no trespassing signs, rugged terrain and security patrols. See 50 Fed. Reg. 7057 (February 20, 1985). In that case, the property was extremely rugged and mountainous, creating an effective natural barrier.

In analyzing what constitutes ambient air, it is also important to know who is the “general public.” It is well recognized that individuals who in some way interact or participate with the source’s activities are not part of the general public. Such individuals would include, for example, the owner/operator and its employees, contractors and their employees, vendors and support businesses and their employees, and government agencies and services and their employees.

EPA’s Ambient Air Guidance is Consistent With How Hazardous Air Pollutant Regulatory Programs Are Applied Nationally.

The “bible” for hazardous air pollutant regulation, the TOXIC AIR POLLUTION HANDBOOK (D. Patrick ed. 1994) summarizes the manner in which Ambient Air Concentration (“AAC”) limits are applied in those states that use such limits to regulate hazardous air pollutants. According to the Handbook, what are called “Ambient Concentration Limits” or “ACLs”:

. . . generally are used by requiring sources of the substances to reduce emissions to an amount that assures that the ACL will not be exceeded at the property boundary of the emitting facility

• • •

Alternatively, ambient monitoring can be undertaken to measure the concentrations of the substance at the property line or at locations in the community where people live and, thus, provide a direct measure of success with meeting the ACL. [emphasis supplied.]

Id. at p. 321.

ADEQ's Policy Conflicts With The Regulatory Definition Of Ambient Air Adopted By Rule in Arizona

The ADEQ policy declaring what constitutes ambient air is stated in the Department's December 2004 "Air Dispersion Modeling Guidelines." The Modeling Guidelines are inconsistent with the regulatory definition of ambient air adopted by rule at A.A.C. R18-2-101(12).

According to the ADEQ policy, without regard for whether the public has access to the property within a facility's fenceline or other barrier, "ADEQ recognizes that ambient air begins at the process area boundary (PAB)." Modeling Guidelines § 3.4. The policy defines process area as "the area in which those processes that directly constitute emission generating activity at a facility are operated and contained." Id. ADEQ "does not recognize property boundaries, fencelines, or public access as the boundary between ambient air and the source." Id.

ADEQ's policy contradicts the regulatory definition of ambient air. According to ADEQ's policy, the ambient air boundary is defined without regard to whether the public has access to the area. ADEQ's policy is irreconcilable with the definition adopted by rule in Arizona. The policy should not be applied to force a facility to measure or model ambient air concentrations at locations where the general public is barred from access by fences or other effective barriers. Arizona law sets forth specific procedural requirements for rulemaking, including opportunities for public input. See A.R.S. § 41-1021 et seq. The Department's attempt to apply its process area boundary policy as if it were a rule, in place of the definition of ambient air that actually has been adopted by rule, is invalid under A.R.S. § 41-1030 because it does not comply with the required public rulemaking process.

The Adopted Definition of Ambient Air Should Be Applied in the Proposed Risk Management Analysis

AAI and other groups appreciate ADEQ's recognition as expressed during the September 28, 2005 stakeholder meeting that under appropriate circumstances the measuring point for public exposure to chronic ambient air concentrations should be other than the process area boundary. However, the possible use of the process area boundary concept remains problematic as applied to the Risk Management Analysis ("RMA").

In its proposed RMA guidelines, the Department notes that, for the evaluation of acute exposure, the applicant shall assume exposure in the ambient air. As for chronic exposure, the Department offers to consider "exposure assumptions consistent with institutional or engineering controls that are permanent and enforceable outside the permit" if such controls are approved by the Department. To eliminate any confusion or ambiguity, it should be made clear that both acute and chronic exposure should be measured at the "ambient air" boundary as that phrase is defined by regulation. The meaning of "controls that are permanent and enforceable outside the permit" is not clear. If ADEQ means to require deed restrictions, such restrictions are not needed to determine whether a fence or other physical barrier prohibits access by the general public to portions of an industrial property. Moreover, deed restrictions have traditionally proven to be a significant deterrent to the marketability of property and will adversely impact the value and alienability of affected property well beyond the point at which such restrictions are needed to prevent public access. ADEQ's recognition that a location other than the process area boundary

is the appropriate point at which to measure ambient air concentrations should not be limited to chronic exposure – the definition of ambient air applies with equal force to acute and chronic ambient air concentrations and requires no “permanent and enforceable” controls approved by ADEQ.

It is understandable that ADEQ seeks to be satisfied that if a particular physical barrier or other measure is relied upon by an owner/operator in conducting ambient air quality modeling, that barrier or measure will remain in place for as long as the modeling results are intended to apply. This, however, does not equate to “permanent and enforceable outside the permit” only if approved by the Department. The representations made by an applicant in support of a permit application or RMA are required to be accurate, are therefore enforceable, and should be sufficient for determining the appropriate ambient air boundary.

To the extent, ADEQ seeks additional assurances, rather than insisting on an approved control that is permanent and enforceable outside of the permit, an equally if not more effective restriction would be a suitable condition to be included in the air quality permit for the facility. A permit condition would be at least as effective as a deed restriction in providing protection for the public, and would have the added benefit of being applicable only so long as the permitted activity is being conducted. This is unlike a deed restriction, which would be a permanent cloud on the title of the property.

It is instructive to note EPA’s treatment of what constitutes the protected air medium for purposes of its Risk Management Plan (“RMP”) requirements under Section 112(r) of the Clean Air Act. A key element of the RMP is the Offsite Consequence Analysis in 40 C.F.R. § 68.165. According to EPA, the medium to be protected from the impact of regulated hazardous substances are what are considered “offsite” which is defined as “areas beyond the property boundary of the stationary source or areas within the property boundary to which the public has routine and unrestricted access during or outside business hours.” 40 C.F.R. § 68.3 [emphasis supplied].

Conclusion

In sum, whenever EPA has been faced with the issue now confronting ADEQ, it has consistently taken the position that public access is the key criterion for determining what constitutes ambient air or the protected medium as far as air quality. We can find no instance in which the concept of “process area boundary” was considered relevant, much less the sole basis for defining ambient air. As applied by ADEQ, the concept of process area boundary runs counter to the definition of ambient air adopted by rule in Arizona.

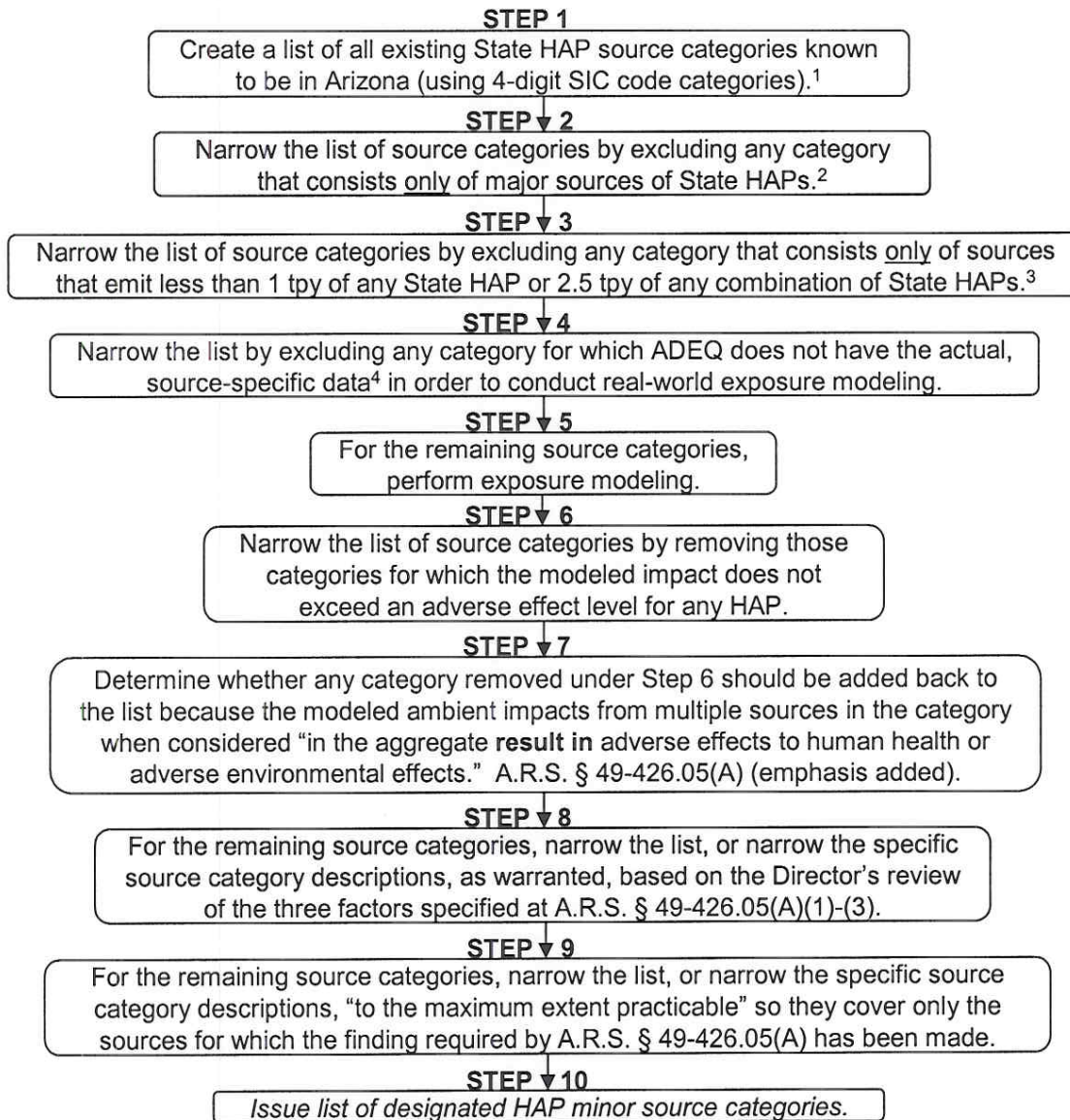
TAB 4

HAP MINOR SOURCE CATEGORY DESIGNATIONS

Comparison of Joint Business and ADEQ Methods For Source Category Listings

STATUTORY CRITERIA A.R.S. § 49-426.05(A)	JOINT BUSINESS PROPOSAL	ADEQ PROPOSAL
Listings are applicable only to HAP nonmajor sources?	Yes	Yes
Listing decisions are based only on emissions from HAP nonmajor sources?	Yes	No; for some categories ADEQ uses emissions from HAP major sources as the basis for making listing decisions for HAP non-major sources.
Listing decisions are based on the "results" of source "emissions"?	Yes	No; decision is based on hypothetical or potential impacts or risks of exposure, due to use of many conservative or unrealistic assumptions rather than site-specific data.
Listing decision considers the number of persons likely exposed from sources in the category?	Yes	No
Listing decision considers whether the category should be limited to a subset of HAP nonmajor sources (i.e., HAP nonmajor sources well above the 1.0/2.5 tpy thresholds but below the HAP major source thresholds)?	Yes	Unlikely; no evidence that this criterion is applied to source category decisions.
Listing decision considers whether a source category should be limited to particular geographic area?	Yes	No
Listing decision defines source categories "to the maximum extent practicable" so that designated categories cover only those sources for which the required finding has been made?	Yes	Partially; uses 4-digit SIC classifications as a tool to narrow source categories; however, for some source categories, uses evaluation of a single source as the basis for listing all sources that fall under the single source's 4-digit SIC category, including, but not limited to, generic SIC categories 2679, 3089, 3999, and 5169.

Designation of State HAP Minor Source Categories Pursuant to A.R.S. § 49-426.05(A)



¹ ADEQ should already have access to this information. The statute required ADEQ to (i) identify the HAPs emitted in the state that present a threat of adverse effects and (ii) conduct a "statewide survey to identify permitted and non-permitted sources of these substances. . . ." A.R.S. § 49-426.08(A)(1) & (4). The Director is authorized to gather HAP data from sources. A.R.S. § 49-426.05(B).

² Source category designations are for minor sources of HAPs. A.R.S. § 49-426.06(A)(1) & (2). The determination should be based on a source's "potential to emit" HAPs, as modified by A.R.S. § 49-426.06(H) & (I). ADEQ should already have access to the emissions information needed to make this determination for existing Arizona sources, because the statute required ADEQ to gather the information. A.R.S. § 49-426.08(A)(4). The Director is authorized to gather HAP data from sources. A.R.S. § 49-426.05(B).

³ Sources that emit less than the 1 tpy and 2.5 tpy thresholds are not subject to the State HAP program. A.R.S. § 49-426.06(A)(2).

⁴ Assumptions, default values, and hypotheticals are not to be used in the modeling, because the Director cannot list a source category unless he finds that "**emissions of [HAPs] from sources in the category . . . result in** adverse effects to human health or adverse environmental effects." A.R.S. § 49-426.05(A) (emphasis added). The Director is authorized to gather HAP data from sources. A.R.S. § 49-426.05(B).

**EXPOSURE MODELING
PROPOSAL**

**FOR IDENTIFYING HAZARDOUS AIR POLLUTANT
SOURCE CATEGORIES UNDER A.R.S. § 49-426.05(A)**

BY

**PATRICK ALLEN RYAN, PH.D.
RYAN ENVIRONMENTAL
8170 EAST DEL CADENA DRIVE
SCOTTSDALE, AZ 85258**

TO

**ARIZONA DEPARTMENT OF
ENVIRONMENTAL QUALITY**

**ON ARIZONA HAZARDOUS AIR
POLLUTANT RULEMAKING**

October 19, 2005

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1. INTRODUCTION.....	1-1
1.1 Background.....	1-1
1.2 Study Objective	1-2
1.3 Summary of Approach.....	1-2
1.4 Report Organization.....	1-2
2. FRAMEWORK FOR HUMAN EXPOSURE ESTIMATES	2-1
2.1 SOURCE-SPECIFIC INFORMATION	2-1
2.2 Atmospheric Dispersion Modeling.....	2-2
2.2.1 State List of HAPs.....	2-3
2.2.2 Hierarchy of Atmospheric Dispersion Models.....	2-3
2.3 Human Activity Model	2-6
2.4 Population Model.....	2-7
2.5 Penetration of the outdoor HAP Concentration Indoors.....	2-7
3. SUMMARY	3-1
4. REFERENCES.....	4-1

1. INTRODUCTION

1.1 BACKGROUND

Arizona entered a stakeholder process for carrying out Arizona Hazardous Air Pollutants (HAPs) rules. This proposal recommends a scientifically valid method for modeling exposure for purposes of finding by the ADEQ Director that “emissions of hazardous air pollutants from sources in the category [proposed for listing] individually or in the aggregate result in adverse effects to human health or adverse environmental effects.” A.R.S. §49-426.05(A). If the ADEQ Director cannot make this finding, he or she is not authorized to name or list a source category for purposes of the state HAPs rule. *Id.*

Notably, the statutory language describing the finding the Director must make to name a source category uses the phrase “result in adverse effects.” It does not state, “potentially result in adverse effects,” or “result in a risk of adverse effects.” Also, the statutory language refers to “emissions of hazardous pollutants from sources.” It does not refer to potential, hypothetical, or assumed emissions. Nor does it refer to hypothetical sources or assumed source characteristics. The statutory language is grounded firmly in reality. The proposed method in this Report presumes the specific language selected by the Legislature is meaningful and controlling.

The proposed method estimates adverse effects emulating the U.S. Environmental Protection Agency (EPA, 2002) approach. EPA assesses average long-term inhalation exposures of the general population, or a specific subpopulation, over spatial scales ranging from urban to national. The EPA method adopted a transparent set of exposure assumptions and estimations, as is fitting for a screening study. The Arizona statutory language would not support use of a screening study to make the finding required by the statute. This is because the ADEQ director must find “emissions of hazardous air pollutants from sources in the category [proposed for listing] individually or in the aggregate result in adverse effects to human health or adverse environmental effects.” Accordingly, the proposal is a refined method acceptable for site-specific source adverse effect determinations.

Site-specific studies necessitate the use of actual site-specific emission information. This data, read by a suitable atmospheric dispersion model, result in an estimate of outdoor HAP concentrations by geographic location. Site-specific studies also necessitate collecting site-specific population data. So, funding studies that track representatives of demographic groups as they move among indoor and outdoor environments by geographic location around each HAP source is important. When individuals are indoors, it is necessary to estimate the expected penetration of the outdoor HAP concentration indoors. The concentration estimated indoors and outdoors, from source specific emissions, following the time sensitive movement of surveyed individuals by geographic location are combined into a time-weighted average concentration. A final analysis that qualitatively relates these estimates of actual human exposure from source-specific emissions to the population in the community must be made, as this is the population of interest under the statute.

1.2 STUDY OBJECTIVE

This study offers a scientifically sound method for estimating HAP exposure concentrations in the ambient air resulting from emissions from a source, for purposes of A.R.S. § 49-426.05(A).

1.3 SUMMARY OF APPROACH

This Report recommends use of an adaptable human exposure modeling framework shown in **Figure 1-1**. Within this framework, scientifically sound methods for identifying source categories subject to HAPRACT involves five major steps:

1. Collecting accurate source-specific HAP emissions data. Gathering accurate information used to conduct source-specific HAP modeling is an essential step.
2. Tracking Individual Community Residents from selected Demographic Groups. Studies must be conducted to track the movement of community residents by geographic location. This information will allow an estimate of the maximum hourly average and longer-term concentration exposure.
3. US Census Population Data. Information from the US Census tells us of the number of people in near by communities by demographic group.
4. Estimating HAP Outdoor Concentrations. The federal list of HAPs is diverse. The air dispersion model selected for a specific source depends on four HAP physicochemical properties.
5. Estimating Outdoor HAP Concentration Penetration Indoors. Review of scientific literature will be used to estimate penetration of outdoor HAP concentrations indoors. Absent data for specific HAPs, a scientific approach must be developed to determine whether the use of an existing HAP penetration value is suitable for use with other HAPs.

1.4 REPORT ORGANIZATION

Organization of this written testimony is in three sections. Background information, study objective, summary of approach, and report organization are in Section 1. The proposed method for estimating whether site-specific sources cause an adverse effect appears in Section 2. References cited in this report are in Section 3.

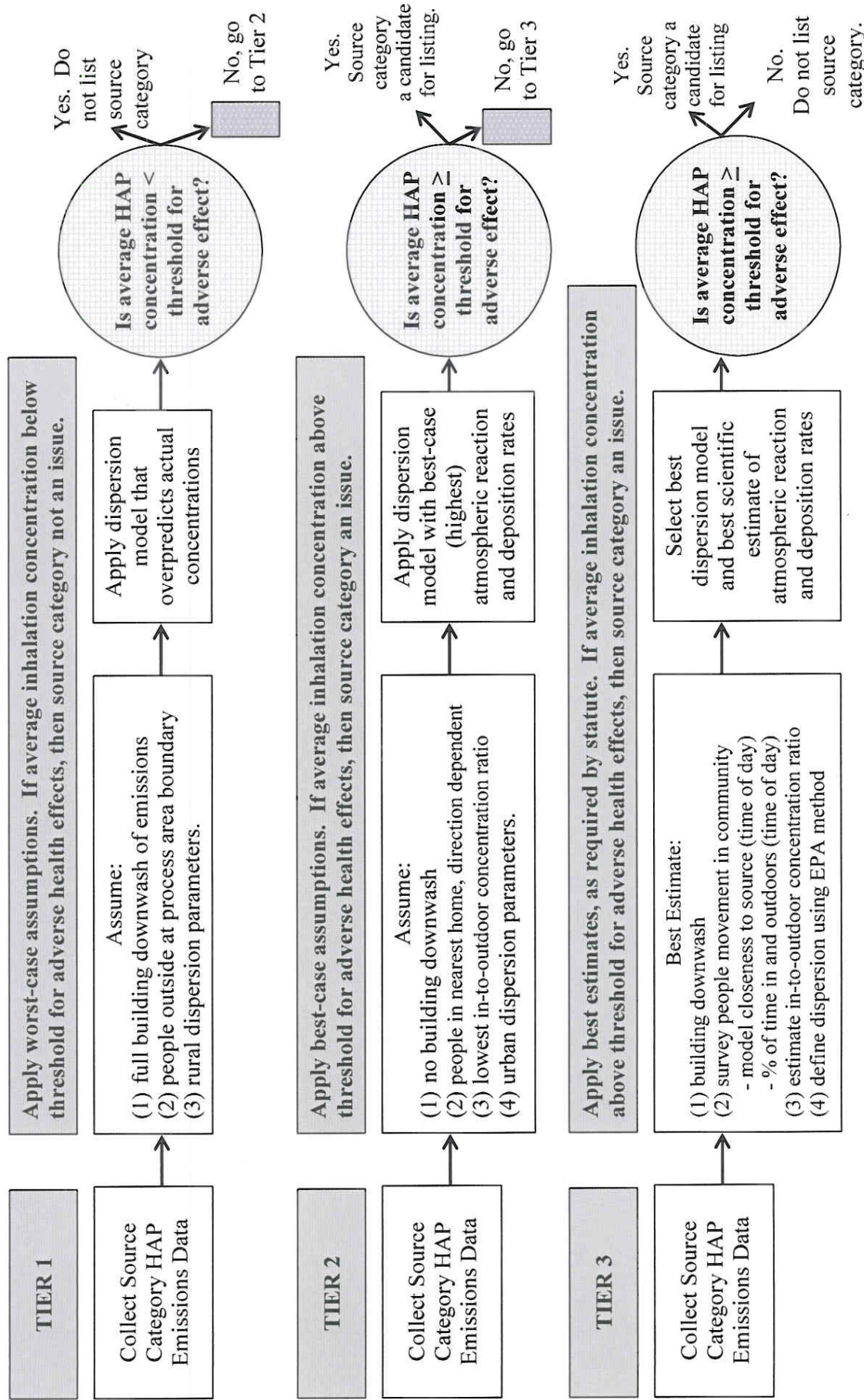


Figure 1-1. Framework for Source Category specific Human Exposure Estimates

2. FRAMEWORK FOR HUMAN EXPOSURE ESTIMATES

A portion of the Arizona HAP rule (A.R.S. § 49-426.05) focuses on identifying source categories that result in an acute (short; 1-hour) or chronic (long; 30-year exposure) adverse effect. HAP emission variation by elevation plays an important part in whether a source category presents an adverse effect. The lifetime of the HAP (the time it persists in the atmosphere) is relevant. To show that a source category results in an adverse human health effect also involves additional data. The additional data are a continuous history of the location (direction and distance from the source) and movement of individuals in the community compared with the source and whether the individuals are indoors or outdoors. This information is important, as individuals 10-km away are far less impacted than individuals 1-km away.

To address such issues, EPA developed a HAP modeling framework. EPA (2002) reports that the Hazardous Air Pollutant Exposure Model, version 4 (HAPEM4), is a screening tool suitable for assessing average long-term inhalation exposures of the general population, or a specific subpopulation. The EPA model limits include spatial scales ranging from urban to national. As a result, the EPA screening tool does not apply to acute (1-hour) time frames, source-specific spatial scales, or rural areas. In order to address these additional scenarios, a Source-specific Hazardous Air Pollutant Exposure Modeling (SHAPEM) framework is needed.

Figure 2-1 of this Report shows the Source-specific Hazardous Air Pollutant Exposure Modeling (SHAPEM) framework offered in this proposal. The framework consists of six parts. Source specific information (HAP emission locations and stack characteristics, relevant building data, the ambient air boundary, and selection of rural or urban dispersion) must be specified. An atmospheric dispersion model is selected from a suite of available atmospheric dispersion models (for example, ISCST3). The model is used to predict the impact of a HAP source on the outdoor air at distances into the surrounding community, accounting for building downwash, and the ambient air boundary. A human activity model estimates the movements of subgroups of humans in the community and whether indoors or outdoors. A population model identifies the number of individuals in the community within demographic groups. An indoor model estimates the outdoor HAP concentration penetration indoors. A post-processing model combines the outdoor air concentration by location and time with human activity by geography, population demographics, and the outdoor concentration penetration indoors to estimate acute and chronic human health exposure.

2.1 SOURCE-SPECIFIC INFORMATION

Gathering source specific data involves identifying HAP emissions, emission locations and stack characteristics. It entails numerically translating relevant building dimensions for downwash calculations and the ambient air boundary for defining the minimum distance to make exposure calculations. It also involves determining whether the relevant setting should be characterized as rural or urban.

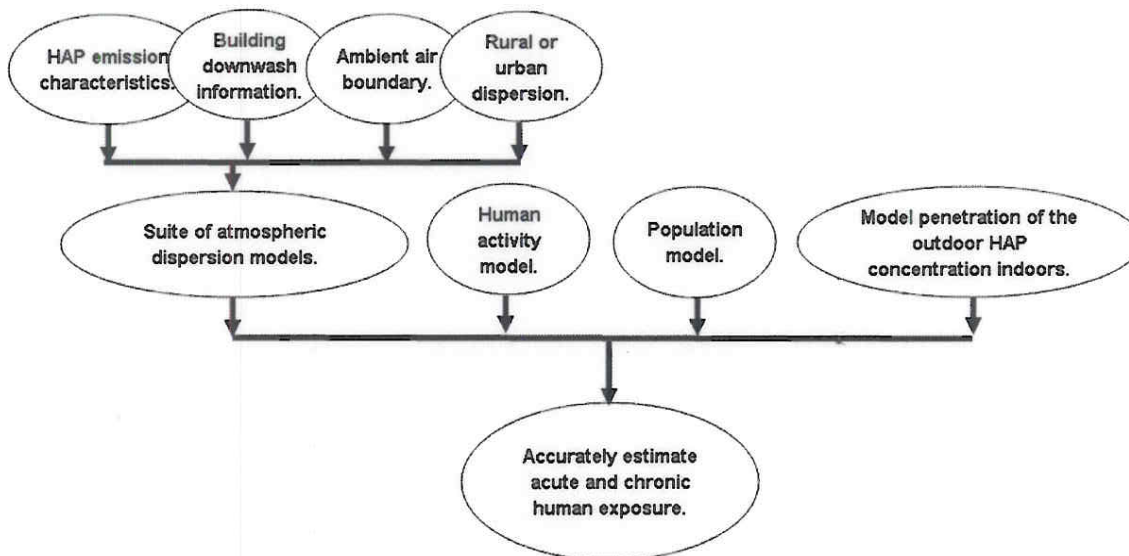


Figure 2-1. Proposed Source-specific Hazardous Air Pollutant Exposure Modeling Framework.

It would be suitable to apply worst-case assumptions and default values to readily eliminate source categories that would not possibly create an adverse effect. On the other hand, it would be inappropriate to rely on any worst-case assumptions or default values, rather than data, to make a finding that "emissions" from a source category "result in" adverse effects. For clarification purposes, applying vendor stack characteristics would be a fitting data substitution absent site-specific stack characteristics. However, default stack characteristics would be inappropriate as the source characteristics could be substantially different.

Alternately, best-case assumptions are useful and appropriate for quickly designating source categories that result in an adverse effect for purposes of the statute. For example, after compiling accurate and specific source characteristics the selection of best-case assumptions could involve ignoring downwash, setting ambient air as the farthest minimum distance to an actual house in any direction from the HAP sources, and applying urban dispersion. By using these assumptions, the ambient air concentration of HAP emissions will tend to be understated. Therefore, if best-case assumptions result in an adverse effect, the source category can be designated. Therefore, either best-case assumptions or actual data must be used in all components of the exposure analysis for the purposes of the source category listing.

2.2 ATMOSPHERIC DISPERSION MODELING

Selecting an atmospheric dispersion model to predict concentrations of source specific HAP emissions can be a difficult task. Each HAP is unique. For example, benzene is predominately a gas in the atmosphere. Cadmium is bound to particles. As most HAPs exist in either the gas phase or particle-bound, but not both, an atmospheric dispersion model that predicts gas or particle-bound concentrations is usually enough.

But a few HAPs exist significantly in the atmosphere as both a gas and particle-bound (for example, benzo(a)pyrene and mercury). For these few HAPs, an atmospheric dispersion

model that simultaneously predicts the exchange between and gas and particle-bound concentrations is important. The use of a single comprehensive atmospheric dispersion model to predict the transport, transformations, and concentration of every HAP could be excessively complicated and time-consuming. Accordingly, it is practically important to review the list of HAPs (see **Section 2.2.1**) and develop a plan for selecting a hierarchy of appropriate atmospheric dispersion models for each HAP (see **Section 2.2.2**).

2.2.1 State List of HAPs

A.R.S. § 49-426.04 requires that the State list of HAPs include all federal HAPs. ADEQ documents indicate that at least 73 federal HAPs are emitted by Arizona industries in sufficient quantities to potentially require evaluation. These 73 HAPs that have been the focus of ADEQ's documents appear in **Table 2-1**.

2.2.2 Hierarchy of Atmospheric Dispersion Models

EPA (2005) identifies seven atmospheric models for estimating outdoor concentrations for exposure modeling. The seven models are CMAQ (for reactive species); ISCST3, ASPEN (large scale domains, such as the entire U.S.) and AERMOD (for urban plumes; short and long-term); and Caline and CAL3QHC (for roadways). Application of the simplest of these models (without accounting for reactions and other HAP concentration loss mechanisms) would be a useful screening tool.

A source category that does not pass with the screening model, should be further reviewed by applying a more accurate modeling analysis. In selecting a more complex modeling analysis, consideration must be given to what level of complexity is warranted. This consideration involves evaluation of the uncertainty and bias of the seven models on the EPA list by HAP. This entails running some of the models, but to do so for every HAP (identified in **Section 2.2.1**) would be a time-consuming endeavor.

To minimize the time-consuming effort, this proposal recommends grouping HAPs according to relevant qualities, for purposes of identifying the appropriate model. This technique, known as data clustering, is a statistical data analysis technique. Used in many fields, including machine learning, data mining, pattern recognition, image analysis and bioinformatics, data clustering involves partitioning of a data set into groups. In this case, the clustering is of individual HAPs into groups with similar relevant properties.

The relevant properties for air dispersion modeling are the atmospheric form of the HAP and the HAP short and long-term stability in the atmosphere. Designating the atmospheric form of these HAPs (gas, particle-bound, or both) critically decides which HAPs are subject to similar atmospheric physics. A literature review identifying HAP atmospheric reaction rates will help separate HAPs into short-lived, medium-lived, and long-lived. For example, in ISCST3 (EPA, 1995) with urban dispersion the regulatory default is for SO₂ an atmospheric half-life of 4 hours. There are HAPs with similar short-lived characteristics.

Table 2-1. Arizona lists 73 HAPs

Acetaldehyde	Isophorone
Acetophenone	Manganese Compounds
Acrolein	Mercury Compounds
Acrylonitrile	Methanol
Antimony Compounds	Methyl Bromide
Arsenic Compounds	Methyl Chloride
Benzene	Methyl Ethyl Ketone
Benzyl Chloride	Methyl Isobutyl Ketone
Beryllium Compounds	Methyl Methacrylate
Biphenyl	Methyl Tert-Butyl Ether
bis(2-Ethylhexyl) Phthalate	Methylhydrazine
Bromoform	Naphthalene
1,3-Butadiene	Nickel Compounds
Cadmium Compounds	Phenol
Carbon Disulfide	Polychlorinated Biphenyls
Carbon Tetrachloride	Polycyclic Organic Matter (Surrogate -
Carbonyl Sulfide	Benzo(a)pyrene)
2-Chloroacetophenone	Propionaldehyde
Chlorobenzene	Propylene Dichloride
Chloroform	Selenium Compounds
Chromium Compounds	Styrene
Cobalt Compounds	1,1,2,2-Tetrachloroethane
Cumene	Tetrachloroethylene (Perchloroethylene)
Cyanide Compounds	Toluene
Dibenzofurans	1,1,1-Trichloroethane (Methyl Chloroform)
1,4-Dichlorobenzene	Trichloroethylene
Dichloromethane (Methylene Chloride)	2,2,4-Trimethylpentane
N,N-Dimethylaniline	Vinyl Acetate
Dimethyl Formamide	Vinyl Chloride
Dimethyl Sulfate	Vinylidene Chloride (1,1-Dichloroethylene)
2,4-Dinitrotoluene	Xylene (Mixed Isomers)
Ethyl Benzene	
Ethyl Chloride (Chloroethane)	
Ethylene Dibromide (Dibromoethane)	
Ethylene Dichloride (1,2-Dichloroethane)	
Ethylene Glycol	
Ethylidene Dichloride (1,1-Dichloroethane)	
Formaldehyde	
Glycol Ethers (Surrogate - Diethylene glycol, monobutyl ether)	
Hexachlorobenzene	
Hexane	
Hydrochloric Acid	
Hydrogen Fluoride (Hydrofluoric Acid)	

Atmospheric loss of HAPs also occurs from so-called dry deposition (i.e. pollutant deposition on by soil, plants, and surface water) and wet-deposition (i.e. pollutant removal from the atmosphere by precipitation). Dry and wet deposition estimates should use methods suitable for health risk assessment including those identified by Ryan (1993) and Moore et al. (1994). For illustrative applications and results from applying these types of models see Ryan and Cohen (1986) and Cohen and Ryan (1985). Some HAPs also form from the chemical reaction of other species (for example, formaldehyde forms from isoprene reactions). Accordingly, this proposal recommends grouping similar HAPs together to identify the appropriate complex atmospheric model by using these four HAP physicochemical properties. **Table 2-2** identifies the four properties and illustrates how these four properties help distinguish and group HAPs.

Table 2-2. Group similar HAPs according to similar physicochemical properties

Group	HAPs	Atmospheric form (gas, particle-bound, or both)	Transformation rate (half-life)*	Secondary formation	Loss to plants, soil and water
1	Formaldehyde	Gas	2 & 6 hours (summer & winter)		
2	Benzene	Gas	6 & 65 days (summer & winter)		
...		Particle-bound			
N		Both			

* Luecken (2002) reported transformation rates (half-life) may understate that occurring in Arizona areas with elevated temperatures compared with the overall average temperature for the continental United States

The following explains how selecting a model depends on these properties. As shown in Table 2-2, formaldehyde is in the gas-phase, is photochemically reactive, and has a half-life that varies from 2 to 6 hours varying with the time of year (summer or winter). Because of the short-half life, accounting for photochemical reactivity is necessary. Using an unmodified ISCST3, the diurnal and seasonal reactivity changes cannot be exactly described and would need simplification. Whether the simplification is acceptable depends on findings. If the maximum acute or chronic formaldehyde air exposure predicted using ISCST3 (adjusted as appropriate for the penetration indoors) is close to the adverse effect threshold, then it may be necessary to apply a more refined model. CAMx is a more refined model that more accurately treats atmospheric reactivity, provided accurate data on other species concentrations and cloud cover are available. However, CAMx depends on site-specific meteorology existing near rural sources. Thus, application of CAMx may not be possible for many sources in Arizona because of the lack of site-specific meteorology needed to run the model.

The recommended sequence of steps is (1) apply the simplest model in a screening mode; (2) if adverse effects are predicted, run the simplest model in a nonscreening mode or select another model up to the recommended most complicated model; and (3) the most complicated model selected should be dictated by the four HAP physicochemical properties: atmospheric form, atmospheric transformation rate, whether there is secondary formation, and the uptake rate by plants, soil, and water.

2.3 HUMAN ACTIVITY MODEL

Human activity pattern data are used to estimate the frequency and duration of exposure by location and time of day within various microenvironments. Microenvironments are simply outdoor and indoor locations. These data combined with population data and air quality concentrations estimate exposure for specific groups. However, existing EPA (2002) activity data are for urban areas and are not intended for source-specific analysis.

It is necessary to fund and collect source-specific activity pattern data, as none exist suitable for the Arizona HAP rule site-specific applications. This will be a time-consuming task. Nevertheless, that is what A.R.S. § 49-426.05(A) appears to contemplate. As an alternative, it would be suitable to apply worst-case activity assumptions and default values as an initial step to screen out any source categories that will not possibly create an adverse health effect. However, an assumption that the population is always outdoors and located at the property boundary of a facility, or inside of the property boundary, is so extreme and unrealistic that it does not even qualify as a worst-case assumption. If an assumption is so extreme that real world instances of the assumed scenario do not exist, it should be described as such to avoid confusing or alarming the public, if the assumption is used to screen out source categories.

On the other hand, it would also be suitable to apply best-case source-specific assumptions and default values to identify source categories predicted to result in adverse effects, for purposes of A.R.S. § 49-426.05(A). For example, if human indoor exposure at the actual home closest to a source exceeds an accurate adverse effect level, then the source may reasonably be further evaluated. In any case, sources that are not screened out must be further evaluated based either on specific best-case assumptions or accurate data in all other parts of the analysis. Figure 2-1 shows the parts of the analysis that need either an accurate estimate or a best-case assumption.

Activity data come from demographic surveys of individuals' daily patterns. Alternatively, the use of a gps tracking unit could be used. In either case, the data collected must be translated into time spent by geographic location. Besides recording duration by location of a person's activities, surveys are important to collect demographic information about the person sampled. Activity pattern studies also need to collect confirming information and incorporate other data needed but not available from an activity survey. Such data include the number of hours spent outdoors by time of day, the number of days a year spent outside the community, and the number of years spent outside the community. This data is relevant to estimating the acute and chronic exposure of community residents to a HAP source. Using these responses, one can estimate the frequency and duration of exposure for specific groups in communities near various sources of HAPs.

Most activity pattern studies also try to collect information on other qualities of a respondent. For example, the highest education level completed, the number of people in a household, whether anyone in the household is a smoker, and the number of hours spent outdoors by time of day. The demographic information usually includes a person's age, gender, employed or not, and ethnic group.

The available human activity literature provides typical activity patterns, as a percent of time indoors and outdoors. This is useful; however, for site-specific applications, data on the direction and distance of individuals from specific HAP sources by time of day also may be necessary. The reason this information becomes necessary is that, for example, maximum ISCST3 predicted 1-hour outdoor exposures often occur from 10 p.m. to 7 a.m. Thus, it becomes important to know the time of day individuals are closest to a plant. It is also important to know the duration of exposure during a typical day. Shorter durations imply lower exposures. Such data are available only from a site-specific survey. One can see that, for acute 1-hour exposure estimates, why minute-by-minute tracking of individuals may be important. For chronic exposure estimates, less detailed tracking of individuals may be suitable.

2.4 POPULATION MODEL

The ADEQ Director may by rule designate a category of sources subject to the state program for control of HAPs established under section 49-426.06. But to designate a category of sources, the Director must find that emissions of HAPs from one or more sources in the category individually or in the aggregate result in adverse effects. In deciding whether emissions from a category of sources result in adverse effects, the Director shall consider the number of people likely exposed to adverse effects from sources in the category. A.R.S. § 49-426.05(A)(1). Thus, the Arizona HAP statute identifies the need to predict exposure for more than just one individual.

A population model is needed for this purpose. The recommended source of population data by community with demographic detail is the U.S. Census Bureau. The U.S. Census Bureau collects information on where people live, their demographic makeup (example e.g., age, gender, ethnic group), and employment. The 2000 US Census data are available at the spatial resolution of census tracts. Census tracts are small, relatively permanent statistical subdivisions of a county. Census tracts usually contain between 2,500 and 8,000 residents.

The census data are relevant as they show from 1995 to 2000 that 56% of Arizona residents moved (U.S. Census, 2000). This illustrates the value of information about people's time in any community and the time spent in any single location in a community. These data must be considered as they indicate that an individual's chronic exposure to a single source is affected by the duration of his or her stay in a given location.

2.5 PENETRATION OF THE OUTDOOR HAP CONCENTRATION INDOORS

Development of factors to estimate the degree that outdoor HAP concentrations penetrate indoors involves an extensive review of literature and databases. Many indoor to outdoor ratios of hazardous air pollutants (HAPs) do not factor out indoor source contributions; therefore, it is important that the literature review exclude studies with indoor source contributions. A brief literature was conducted to explain this issue.

The brief literature review produced the following findings. Measurements of particle concentrations made for 2-week periods in 294 homes drawn from seven U.S. cities identified 48% as the average outdoor particle concentration penetration indoors (Wallace et al, 2003). Daily ozone concentrations outdoors in a State College, PA study (Liu et al., 1993) were two

times greater than indoors. This equals a penetration rate of 50%, assuming no sources of ozone inside the home. Analysis of a four-day plot of reactive ammonium nitrate concentrations (Lawrence Berkeley National Laboratory, 2003) shows the measured indoor concentration was about 10% of that outdoors (Figure 2-2).

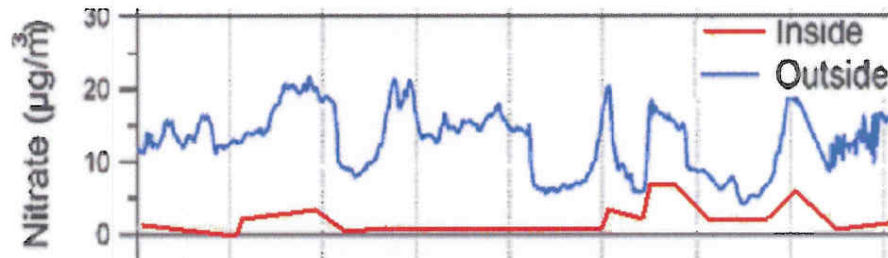


Figure 2-2. Measurements show a low penetration (about 10%) of the outdoor (blue line) ammonium nitrate concentration indoors (red line).

3. SUMMARY

A method is proposed for making source-specific exposure determinations for purposes of A.R.S. § 49-426.05(A). The proposed method involves five major steps:

1. Developing source specific HAP emissions data. Gathering source specific data involves identifying HAP emissions, emission locations and “stack” characteristics. It entails numerically translating relevant building dimensions for downwash calculations and the ambient air boundary for defining the minimum distance to make exposure calculations. It also involves accurately selecting rural or urban dispersion.
2. Estimating HAP outdoor concentrations. The federal list of HAPs is diverse, and so the air dispersion model selected depends on four HAP physicochemical properties.
3. Tracking Individual Community Residents from selected Demographic Groups. Studies must be funded to track the movement of community residents by geographic location. This funding will effectively allow an estimate of the maximum hourly average and longer-term concentration exposure.
4. US Census population data. Information from the US Census tells us of the number of people in nearby communities by demographic groups.
5. Estimating outdoor HAP concentration penetration indoors. Only a literature review of scientific papers will reveal the likely penetration of outdoor HAP concentrations indoors. Absent data for specific HAPs, a scientific approach must be created that decides whether the use of an existing HAP penetration value seems suitable or whether a study must be funded.

These steps must be followed to make the finding required by A.R.S. § 49-426.05(A) prior to designating a source category. Given that these steps would require considerable time and funding to complete, alternate less costly methods could be considered. For example, apply worst-case assumptions and default values to readily eliminate source categories that would not possibly create an adverse effect. However, in contrast, it is recommended that any methodology for making an affirmative finding that a source or source category warrants designation should be scientifically sound and consistent with the statutory criteria, as described in this proposal.

4. REFERENCES

- Cohen Y. and Ryan P.A. (1985) Multimedia modeling of environmental transport: trichloroethylene test case. *Env. Sci. Tech.*, 19, 142.
- Lawrence Berkeley National Laboratory (2003). Understanding the Indoor Concentrations of Outdoor Aerosols in Residences. Summer 2003. Newsletter. Web site: <http://eetd.lbl.gov/newsletter/nl14/ResidenceAerosols.html> .
- Liu L., P. Koutrakis, H. Suh, J. Mulik, and R. Burton (1993). Environmental Health Issues. *Environmental Health Perspectives* Volume 101, Number 4, September.
- Luecken, D. (2002). Atmospheric Formation and Decay of Air Toxics – Implications for Exposure Assessments. Air Toxics Exposure Assessment Workshop. June 25.
- Moore, G., P. Ryan, D. Schwede, and D. Strimaitis. (1994). Model Performance Evaluation of Gaseous Dry Deposition Algorithms. Paper presented at the Air & Waste Management Association 87th Annual Meeting & Exhibition.
- Ryan P.A. (1993) Review of mathematical models for health risk assessment IV - Intermedia chemical transport. *Env. Software*.
- Ryan P.A. and Cohen Y. (1986) Multimedia transport of particle-bound organics: benzo(a)pyrene test case. *Chemosphere*, 15, 21-47.
- Seitz, J. (1994). Guidance for Initial Implementation of Section 112(g). Director, Office of Air Quality Planning and Standards (MD-10). June 28.
- United States Census 2000 (2005). Migration for the Population 5 Years and Over for the United States, Regions, States, Counties, New England Minor Civil Divisions, Metropolitan Areas, and Puerto Rico: 2000 (PHC-T-22). Web site: <http://www.census.gov/population/www/cen2000/phc-t22.html> .
- United States Environmental Protection Agency (2005). What Human Exposure Data and Models are Available? Web site: <http://www.epa.gov/OSP/presentations/airtox/ozkaynak.pdf>
- United States Environmental Protection Agency (2002). The HAPEM4 User's Guide Hazardous Air Pollutant Exposure Model, Version 4. Prepared for: Ted Palma, Office of Air Quality Planning and Standards US Environmental Protection Agency. Prepared by: Arlene Rosenbaum, ICF Consulting, under subcontract to: EC/R Incorporated. May 31.
- United States Environmental Protection Agency (1995). User's Guide for the Industrial Source Complex (ISC3) Dispersion Models, Volume 1 – User's Instructions. U.S. EPA, Office of Air Quality Standards, Emissions, Monitoring and Analysis Division, Research Triangle Park, North Carolina. September 1995. EPA-454/B-95-003a.

United States Environmental Protection Agency (1994). Documentation of De minimis Emission Rates- Proposed 40 CFR Part 63, Subpart B. EPA-453\R-93-035. February.

Wallace L., H. Mitchell, G. O'Connor, L. Neas, M. Lippmann, M. Kattan, J. Koenig, J. Stout, B. Vaughn, D. Wallace, M. Walter, K. Adams, and L. Liu (2003). Particle Concentrations in Inner-City Homes of Children with Asthma: The Effect of Smoking, Cooking, and Outdoor Pollution. Environmental Health Perspectives Volume 111, Number 9, July.

Wegman, L. (1997). Stakeholder Memorandum. Web site:
http://www.epa.gov/ttn/oarpg/t5/fr_notices/hold/transmem.pdf#search='EPA%20de%20minimis%20definition'

ARIZONA MINING ASSOCIATION

**SCIENCE AND TECHNICAL
COMMENTS**

OF

**PATRICK ALLEN RYAN, PH.D.
RYAN ENVIRONMENTAL
8170 EAST DEL CADENA DRIVE
SCOTTSDALE, AZ 85258**

TO

**ARIZONA DEPARTMENT OF
ENVIRONMENTAL QUALITY**

**ON ARIZONA HAZARDOUS AIR
POLLUTANT RULEMAKING**

September 9, 2005

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1. INTRODUCTION.....	1-1
2. ANALYSIS OF WESTON’S PROPOSED MODELING METHODOLOGY	2-1
2.1 Weston’s use of the EPA SCREEN3 model for HAP predictions is not consistent with EPA guidance. For inert HAPs, the EPA SCREEN3 model is 54% more conservative than the EPA recommended use of ISC3.	2-1
2.2 For reactive species with data, the EPA SCREEN3 model is 90% to 150% more conservative than the EPA recommended use of CMAQ.	2-2
2.3 SCREEN3 is not appropriate for making the finding required by the statute with respect to HAPs that have significant dry plus wet deposition.	2-3
2.4 The Proposal relies on the overly conservative assumption that members of the public remain 25 meters (82 feet) from a HAP source.....	2-3
2.5 The SCREEN3 prediction at the 25-m default distance is greater than the maximum concentration predicted for a typical distance from an emissions unit to a home.	2-4
2.6 The Proposal’s use of outdoor concentrations for chronic exposure studies does not account for the fact individuals spend 90% of their time indoors and an outdoor concentration’s penetration indoors is as low as 10%.	2-4
2.7 The Proposal does not follow EPA guidance for determining the location of the public air space (i.e., “ambient air”).....	2-5
2.8 The EPA SCREEN3 model uses rural dispersion coefficients that result in excessively conservative (200%) concentrations in urban areas.....	2-6
2.9 The low-level generic volume source release height overstates by 500% to 800% the outdoor concentration effect of high stack releases	2-7
2.10 If there are multiple sources at a facility, the Proposal conservatively aggregates the worst case outdoor concentration from each source. This overestimates by 283% the ISC3 predicted concentration from three sources with a reasonable distance between them.....	2-7
2.11 No mention is made of how cavity zone concentrations are calculated	2-8
2.12 The Proposal’s overprediction of actual HAP impacts is compounded by reliance on other assumptions and hypotheticals.	2-8
3. PRACTICAL IMPLICATIONS	3-1
4. CONCLUSION	4-1
5. REFERENCES.....	5-1
AUTHOR CREDENTIALS.....	Appendix A

1. INTRODUCTION

Weston Solutions, Inc. (Weston), a contractor hired by the Arizona Department of Environmental Quality (ADEQ), developed a document entitled, "Procedure for Air Quality Dispersion Modeling for the Arizona HAPRACT Rule," dated July 5, 2005 (Proposal). This document was prepared as part of a stakeholder process for developing Arizona Hazardous Air Pollutants rules (state HAPs rules). The ADEQ Director is considering using the Proposal to predict human exposure to source specific HAP emissions. The ADEQ Director must find "emissions of hazardous air pollutants from sources in the category [proposed for listing] individually or in the aggregate result in adverse effects to human health or adverse environmental effects." A.R.S. §49-426.05(A).¹ If the ADEQ Director cannot make this finding, then he is not authorized to designate or list a source category for purposes of the state HAPs rule. *Id.* On behalf of the Arizona Mining Association (AMA), I reviewed this Proposal to determine whether it is scientifically valid and would support the ADEQ Director's finding.

The statutory finding the Director must make to designate a source category includes the phrase "result in adverse effects." The statutory language does not state, "potentially result in adverse effects," or "result in a risk of adverse effects." Also, the statutory language refers to "emissions of hazardous pollutants from sources." It does not refer to potential, hypothetical, or assumed emissions. Nor does it refer to hypothetical sources or assumed source characteristics. The statutory language is grounded firmly in reality. In contrast, the Proposal states, "the document also addresses the procedures to be followed to model the facilities to determine their *potential* impacts on the surrounding communities." Proposal, p.1 (emphasis added). The analysis in this Report presumes the specific language selected by the Legislature is meaningful and controlling.

As described in this Report, the Proposal adds conservatism upon conservatism, resulting in a methodology that is overly conservative. As described in this Report, the Proposal predicts source specific HAP emission air concentrations up to 1,000 to 60,000 times actual human exposure (**Figure 1-1**). The Proposal's use of a 120% factor to mitigate conservatism is insufficient. The proposed overly conservative methodology does not provide a reasonable basis for the ADEQ Director to find "emissions of hazardous air pollutants from sources in the category [proposed for listing] individually or in the aggregate result in adverse effects to human health or adverse environmental effects."

¹ The scope of work for this Report did not include review of Weston's separate proposals for determining adverse effects to human health.

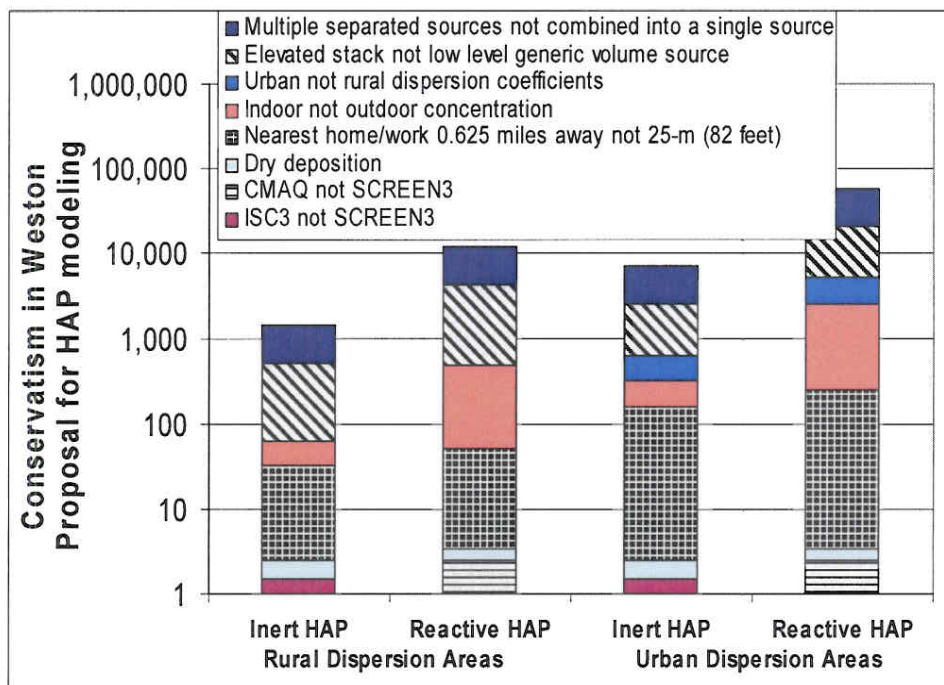


Figure I-1. Estimated conservatism in Proposal modeling method.

2. ANALYSIS OF WESTON'S PROPOSED MODELING METHODOLOGY

2.1 WESTON'S USE OF THE EPA SCREEN3 MODEL FOR HAP PREDICTIONS IS NOT CONSISTENT WITH EPA GUIDANCE. FOR INERT HAPS, THE EPA SCREEN3 MODEL IS 54% MORE CONSERVATIVE THAN THE EPA RECOMMENDED USE OF ISC3.

Weston proposes using the conservative EPA SCREEN3 model to estimate outdoor HAP concentrations. The Proposal says this approach follows both EPA air quality modeling guidelines (EPA, 1996) and ADEQ modeling guidance (ADEQ, 2004). The referenced EPA (1996) modeling guideline is out-of-date. The current EPA (2003) (40 CFR Ch. I, p. 453.) guideline "recommends air quality modeling techniques that should be applied to State Implementation Plan (SIP) revisions for existing sources and to new source reviews (NSR), including prevention of significant deterioration (PSD). (See Ref. 1, 2, 3). Applicable only to criteria air pollutants, it is intended for use by EPA Regional Offices in judging the adequacy of modeling analyses performed by EPA, State and local agencies and by industry." HAPs are not criteria air pollutants.

The Proposal does not consider using any of the seven dispersion models that EPA has stated should be considered for estimating outdoor concentrations for exposure modeling. The seven models are CMAQ (for reactive species); ISC, ASPEN (large scale domains, such as the entire U.S.) and AERMOD (for urban plumes; short and long-term); and Caline and CAL3QHC (for roadways) (EPA, 2005b). EPA's recommendations do not include the SCREEN3 model used in the Proposal. The Proposal does not explain why SCREEN3 was selected instead of one or more of these models.

ISC3 is an EPA guideline model recommended for HAP modeling (EPA, 2005b). Comparing inert HAP model concentration predictions by SCREEN3 and ISC3 for rural and urban dispersion coefficients will show conservatism in SCREEN3. To compare the models, ISC3 was run using an ADEQ ISC meteorological file consisting of 1991 Phoenix Sky Harbor airport surface and 1991 Tucson airport upper air data. The modeling used HAP emissions source characteristic reflecting the Weston generic volume source 2-story (24-foot high, 100-foot long) building. This surrogate source has the following characteristics: the HAP emissions release is 12 feet (3.66 m) above ground; the initial lateral and vertical dimensions are σ_{y0} at 23.4 feet (100/4.3 or 7.1 m) and σ_{z0} at 11.2 feet (24/2.15 or 3.4 m); and HAP concentrations were calculated at the Weston default 25-m process area boundary (PAB).

Table 2-1 lists the maximum 1-hour HAP concentrations predicted by SCREEN3 and ISCST3 for rural and urban dispersion coefficients at 25-m. For both rural and urban areas, the maximum SCREEN3 prediction exceeds the maximum ISCST3 prediction by 54%. In other words, the SCREEN3 prediction is 154% more than the ISC3 prediction.

Table 2-1. Comparison of SCREEN3 and ISCST3 maximum 1-hour predicted concentrations for the ADEQ generic volume source at 25-m for rural and urban dispersion coefficients

DOWNWIND DISTANCE (M)	SCREEN3 ($\mu\text{g}/\text{m}^3$)		ISCST3 ($\mu\text{g}/\text{m}^3$)		SCREEN3/ISCST3	
	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN
25	1.0	0.74	0.65	0.48	1.54	1.54

Other state agencies have recognized that screen modeling is not designed to predict actual ambient concentrations of air pollutants. For example, the New Mexico Air Quality Bureau (2002) modeling guidance says “DO NOT PANIC if screening analyses show the facility is exceeding NAAQS or NMAAQs!! In most cases screening analyses are inadequate.” Oklahoma’s Air Quality Division (OAQD) and the Texas Commission on Environmental Quality (TCEQ) published guidance that recognizes that EPA models can be extreme over predictors. TCEQ (2004a) states these over predictions have led to significant use of agency staff, applicants, and the public time. The time used to develop control strategies meant to protect public health and welfare may not have been needed. The OAQD (2003) sums up this issue by stating that because EPA models may over-predict the impact in an analysis, a modeled prediction alone does not mean there will be a condition of an adverse health effect. A prediction is only a flag signaling *potential* issues. OAQD staff may require the source perform more complex modeling or change physical values of the source to reduce ambient impacts. If modeling continues to predict an exceedance, the OAQD may require the source to conduct monitoring. Therefore, as the Oklahoma Air Quality Division aptly concludes, dispersion screen modeling analysis is useful as *information* to reassure the public that a source’s permitted emissions *could not possibly cause* an adverse health effect. In contrast, a screen model is not suited to determine whether a source actually “results in” adverse health effects.

2.2 FOR REACTIVE SPECIES WITH DATA, THE EPA SCREEN3 MODEL IS 90% TO 150% MORE CONSERVATIVE THAN THE EPA RECOMMENDED USE OF CMAQ.

EPA recommends using the CMAQ dispersion modeling for estimating outdoor concentrations of reactive HAPs (EPA, 2005b). As CMAQ is an EPA guideline model recommended for HAP modeling, comparing reactive HAP model concentration predictions by SCREEN3 and CMAQ will show any conservatism in SCREEN3 for reactive HAPs with data. For the reactive HAPs benzene and formaldehyde CMAQ produced 70% and 25% lower concentrations than a nonreactive ISC analysis (Ching et al., 2004). As SCREEN3 is about 50% more conservative than ISC3 (see Section 2.1), SCREEN3 is 150% and 90% more conservative for benzene and formaldehyde than CMAQ. Additional data would be needed to identify the conservatism for other reactive HAPs.

Of the seven dispersion models EPA recommends for HAP modeling, only CMAQ (a photochemical grid model) applies to predicting reactive HAP concentrations (EPA, 2005b). Past studies (for example, Texas Commission on Environmental Quality, 2004b) reveal the process from start to finish of obtaining approval of a photochemical

ozone modeling analysis involves a calendar year or longer. This means that developing a CMAQ photochemical grid analysis for one HAP will be people and computationally intensive in order to perform a reality-based scientific analysis of reactive HAPs.

2.3 SCREEN3 IS NOT APPROPRIATE FOR MAKING THE FINDING REQUIRED BY THE STATUTE WITH RESPECT TO HAPS THAT HAVE SIGNIFICANT DRY PLUS WET DEPOSITION.

Dry deposition involves pollutant concentration removal from the atmosphere through pollutant uptake or reaction with vegetation, the ground surface, and soil. Wet deposition involves pollutant removal from the atmosphere by precipitation. Gaseous pollutants (for example, benzene) dissolve in, absorb to, or adsorb to precipitation, which deposits onto the earth. As precipitation falls it also captures particle-bound pollutants (for example, cadmium).

EPA guidance states that, when modeling to estimate the actual exposure of people to HAPs with significant dry plus wet deposition, gravitational settling should be included in the model (40 CFR Ch. I (7-1-03 Edition), p. 473). **Table 2-2** lists the ratio of the maximum annual HAP concentrations predicted by ISCST3 for rural dispersion coefficients at 25-m, 50-m and 1000-m with and without including dry deposition. The particle-bound HAP size distribution used was that required by ADEQ for a recent study. From 25-m to 1000-m, the ISC3 predicted that HAP concentration with dry depletion ranges from 70% to 90% of the concentration that is predicted without accounting for dry depletion. In other words, by ignoring dry depletion the SCREEN3 predicted conservatism ranges from 111% to 142% for particle-bound HAPs. Given this finding, it would not be surprising to find similar conservatism for gaseous HAPs and conservatism by omitting precipitation effects (wet deposition).

Table 2-2. Reduction in HAP annual concentrations by accounting for dry deposition. ISCST3 maximum annual predicted concentrations for the ADEQ generic volume source at 25-m, 50-m, and 1000-m for rural dispersion coefficients

DOWNWIND DISTANCE (M)	ISCST3 (with dry deposition)/ ISCST3 (without dry deposition)
25	0.9
50	0.85
1000	0.7

2.4 THE PROPOSAL RELIES ON THE OVERLY CONSERVATIVE ASSUMPTION THAT MEMBERS OF THE PUBLIC REMAIN 25 METERS (82 FEET) FROM A HAP SOURCE.

The Proposal assumes that members of the public are 25 meters (82 feet) from the HAP source. Moreover, the Proposal assumes that the public remains at this close location for 24 hours per day, every day of the year. The Proposal does not cite any data to support this

assumption for all or any source categories. The assumption is an additional conservative assumption.

2.5 THE SCREEN3 PREDICTION AT THE 25-M DEFAULT DISTANCE IS GREATER THAN THE MAXIMUM CONCENTRATION PREDICTED FOR A TYPICAL DISTANCE FROM AN EMISSIONS UNIT TO A HOME.

The home is the best single location for estimating constant public human exposure. The Proposal does not rely on the typical distance between a home and an industrial facility's emission units. In the absence of data to the contrary, the Proposal conservatively uses 25 m as the default distance from the emission unit to the point of constant public exposure. In some cases, 25 m would be inside a facility's private property, where no private home would be located. 1000 m (0.625 miles) is a more realistic distance from a generic emissions unit to a generic residence. In urban areas, a generic emissions unit might be closer to a generic residence.

In order to identify the effect of this conservatism in the Proposal, SCREEN3 and ISCST3 were used to predict concentrations at 25 m and at the following distances: 50 m, 100 m, and 1000 m. The modeling was performed with urban and rural dispersion coefficients. **Table 2-3** shows the results of this comparison, illustrating how predicted concentrations decline moving farther away from the emission unit. The Table also shows that the SCREEN3 results are much more conservative than the ISCST3 results.

This comparison shows that the Weston SCREEN3 prediction at 25 m is 1250% (rural) and 8222% (urban) greater than the 1000 m predictions. Similarly, the ISCST3 prediction at 25 m is 1083% (rural) and 5330% (urban) greater than the 1000 m prediction. Finally, the SCREEN3 predictions are 54% greater than the ISCST3 predictions.

Table 2-3. Comparison of SCREEN3 and ISCST3 maximum 1-hour predicted concentrations for rural and urban dispersion coefficients for the generic volume source by downwind distance

DOWNWIND DISTANCE (M)	SCREEN3 ($\mu\text{g}/\text{m}^3$)		ISCST3 ($\mu\text{g}/\text{m}^3$)	
	RURAL	URBAN	RURAL	URBAN
25	1.0	0.74	0.65	0.48
50	0.89	0.48	0.57	0.31
100	0.70	0.25	0.45	0.16
1000	0.08	0.009	0.06	0.009

2.6 THE PROPOSAL'S USE OF OUTDOOR CONCENTRATIONS FOR CHRONIC EXPOSURE STUDIES DOES NOT ACCOUNT FOR THE FACT INDIVIDUALS SPEND 90% OF THEIR TIME INDOORS AND AN OUTDOOR CONCENTRATION'S PENETRATION INDOORS IS AS LOW AS 10%.

The Proposal assumes that exposed members of the public remain in the outdoor air for 24 hours per day. The Proposal does not cite any data to support this assumption. It is another conservative assumption.

Common experience suggests the public spends a significant portion of time indoors. EPA and the United States Consumer Product Safety Commission (1995) report people spend about 90% of their time indoors. A significant proportion of this indoor time is spent within the home. Common experience also suggests that some groups, such as pre-school children, students, the elderly, and nonworking adults may spend even more time indoors at school and/or home. The Proposal does not consider this circumstance when attempting to predict whether emissions will result in adverse effects.

A brief literature search to determine the degree to which outdoor air quality affects indoor air quality revealed the following information. Measurements of particle concentrations made for 2-week periods in 294 homes in seven U.S. cities identified 48% as the average outdoor particle concentration penetration indoors (Wallace et al, 2003). Daily ozone concentrations outdoors in a State College, PA study (Liu et al., 1993) were two times greater than indoors. This equals a penetration rate of 50%, assuming no sources of ozone inside the home. Analysis of a four-day plot of reactive ammonium nitrate concentrations (Lawrence Berkeley National Laboratory, 2003) shows the measured indoor concentration was about 10% of that outdoors (Figure 2-1). Ammonium nitrate is a chemically active species that exists in equilibrium with gaseous nitric acid and ammonia. So, Weston's proposed use of outdoor concentrations would overpredict indoor particle and ozone and ammonium nitrate concentrations by factors of approximately 2 and 10. These findings indicate that use of a 24-hour outdoor air exposure scenario to represent public exposure to HAPs adds yet another level of conservatism.

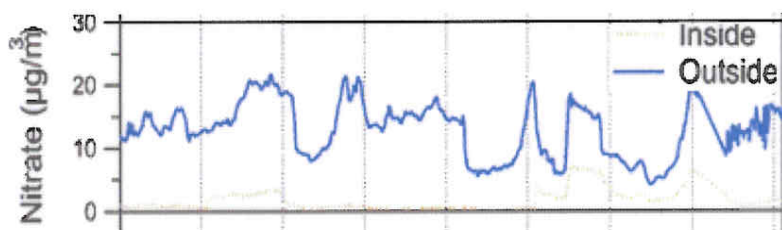


Figure 2-1. Variation in indoor (dotted line) and outdoor (solid line) ammonium nitrate concentration during a December intensive.

2.7 THE PROPOSAL DOES NOT FOLLOW EPA GUIDANCE FOR DETERMINING THE LOCATION OF THE PUBLIC AIR SPACE (I.E., “AMBIENT AIR”).

The Proposal states that HAP modeling procedures will follow EPA guidance. (Proposal, p. 3). However, the Proposal makes an exception for determining the location where the public is exposed to air emissions, otherwise known as the “ambient air.”

EPA (1986) says “[l]et me assure you there is no change in our long-standing national policy with regard to the definition of ambient air. That policy is based on 40 CFR Part 50.1 (c) which defines ambient air as ‘. . . that portion of the atmosphere, external to buildings, to which the general public has access.’ A letter dated December 19, 1980, from Douglas Costle to Senator Jennings Randolph, reaffirmed and clarified this definition by stating the exemption from ambient air is available only for the atmosphere over land owned or controlled by the

source and to which public access is precluded by a fence or other physical barriers.” EPA (1985) further explains “[s]pecifically, for stationary source modeling, receptors should be placed anywhere outside inaccessible plant property.”

In contrast, the Proposal explains that it uses the “process area boundary” (PAB) as the location of public exposure (ambient air). Proposal, p.4. At the August 10, 2005 stakeholder meeting where Weston explained its approach, Mr. Steve Mauch of Weston acknowledged that the approach is not used by EPA or most states, and “is relatively unique to Arizona.”

It is not within the scope of this Report to address whether ADEQ’s PAB policy is legally authorized. The fact that it is *different* and *more stringent* than the way EPA and most states determine the location of public exposure (ambient air) is enough to demonstrate that it adds yet another layer of conservatism to the Proposal. This conservatism is compounded for those source categories for which ADEQ has not gathered source specific information, because the Proposal will assume a hypothetical PAB of 25 meters for all such source categories. Proposal, p. 4.

2.8 THE EPA SCREEN3 MODEL USES RURAL DISPERSION COEFFICIENTS THAT RESULT IN EXCESSIVELY CONSERVATIVE (200%) CONCENTRATIONS IN URBAN AREAS

Weston proposes the conservative EPA SCREEN3 model with rural dispersion coefficients to estimate outdoor concentrations even in urban areas. At the stakeholder meeting on August 10, 2005, Weston representatives said that most HAP sources in Arizona are in rural areas and that there overall is not a large difference in predictions when using rural or urban dispersion coefficients.

To analyze this claim, modeling was conducted using rural and urban dispersion coefficients. Table 2-1 lists the maximum 1-hour HAP concentrations predicted by SCREEN3 and ISCST3 for rural and urban dispersion coefficients at 25-m. The Proposal’s default generic source was used. The Proposal’s recommended use of SCREEN3 with rural dispersion coefficients at 25-m exceeds by a factor of 2 (200%) the ISCST3 prediction with urban dispersion coefficients. Based on this analysis, using the rural dispersion coefficient generally results in a significant overprediction of actual air quality impacts.

At the August 10 stakeholders meeting, Weston representatives also stated that it generally is very difficult to show an urban land use that warrants use of the urban dispersion coefficient. However EPA guidance says (40 CFR Ch. I (7–1–03 Edition), p. 471): “The selection of either rural or urban dispersion coefficients in a specific application should follow one of the procedures suggested by Irwin⁸⁰ and briefly described in paragraphs (c)–(f) of this subsection. These include a land use classification procedure or a population based procedure to determine whether the character of an area is primarily urban or rural. c. Land Use Procedure: (1) Classify the land use within the total area, A_0 , circumscribed by a 3-km radius circle about the source using the meteorological land use typing scheme proposed by Auer⁸¹; (2) if land use types I1, I2, C1, R2, and R3 account for 50 percent or more of A_0 , use urban dispersion

coefficients; otherwise, use appropriate rural dispersion coefficients.” It is unclear why it generally would be difficult to show an urban land use under this guidance.

2.9 THE LOW-LEVEL GENERIC VOLUME SOURCE RELEASE HEIGHT OVERSTATES BY 500% TO 800% THE OUTDOOR CONCENTRATION EFFECT OF HIGH STACK RELEASES

Weston proposes that ADEQ will review source-specific topographical maps, aerial photographs, or other mapping to identify dimensions to use for modeling the source. The Proposal states (Proposal, p. 2-3): “If no emission point data can be found, then a generic volume source will be used to represent the HAP emissions.” Based on statements at stakeholder meetings, ADEQ has not provided Weston this source-specific information for various categories, suggesting that ADEQ may not have such data. If this is so, then the hypothetical low-level volume source description will be used for various source categories. This hypothetical low-level volume source is a 2-story (24-foot high, 100-foot long) building. For this low-level hypothetical source, the HAP emission release height is 12 feet (3.66 m), σ_{y0} is 23.4 feet (100/4.3 or 7.1 m) and σ_{z0} is 11.2 feet (24/2.15 or 3.4 m).

EPA modelers agree that release height is important (EPA, 2005d), so it seems inappropriate to analyze various Arizona HAP emissions with a hypothetical or default assumption of a low-level 12 foot release height. In fact, ground-level concentrations are 500% to 800% more with low-level emissions (Gifford and Hanna, 1973; Hanna et al., 1982). Emission releases from high stacks have more air to pass through on their way to the ground than emissions released at ground-level. A multiple of 5 to 8 reflects the conservatism imposed when HAP source releases from elevated stacks are described by the Proposal’s hypothetical low-level source.

2.10 IF THERE ARE MULTIPLE SOURCES AT A FACILITY, THE PROPOSAL CONSERVATIVELY AGGREGATES THE WORST CASE OUTDOOR CONCENTRATION FROM EACH SOURCE. THIS OVERESTIMATES BY 283% THE ISC3 PREDICTED CONCENTRATION FROM THREE SOURCES WITH A REASONABLE DISTANCE BETWEEN THEM.

The Proposal states that for a facility with multiple emission points, the maximum impact of each stack will be aggregated for comparison to the presumed adverse effect levels. The potential conservatism in this approach studied by considering a facility with a 100-m length fence with three HAP point sources separated by a reasonable distance and each located 25-m from ambient air (**Figure 2-2**), and each stack having identical HAP emission rates.

The SCREEN3 concentration prediction at 25-m from each source is $1 \mu\text{g}/\text{m}^3$. Weston proposes to aggregate these worst case concentrations, which would produce $3 \mu\text{g}/\text{m}^3$ as the maximum total predicted HAP concentration from this three source facility in this example. For comparison, ISCST3 predicts a 1-hour maximum concentration of $1.06 \mu\text{g}/\text{m}^3$ as the combined impact from these three sources, which is 283% lower. This multiple of 2.8 reflects the conservatism imposed by the Proposal’s hypothetical assumption.

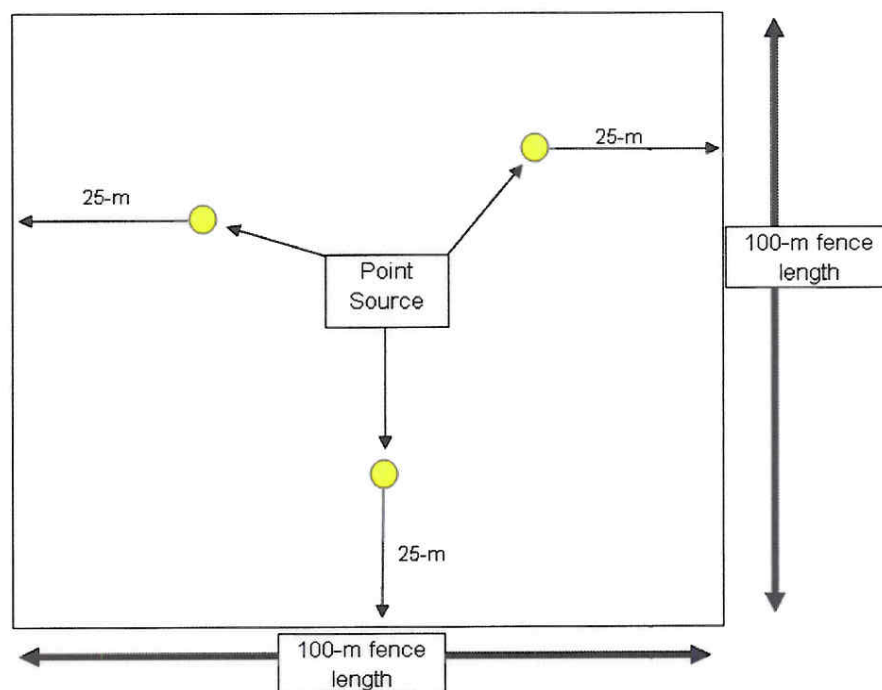


Figure 2-2. Facility with a 100-m length fence incorporating three HAP point sources each 25-m from ambient air

2.11 NO MENTION IS MADE OF HOW CAVITY ZONE CONCENTRATIONS ARE CALCULATED

The Proposal states that SCREEN3 will be used to calculate outdoor concentrations in the cavity zone of buildings. However, the SCREEN3 building effects model gives conservative (overestimated) concentrations for screening purposes (Cambridge Environmental Research Consultants, 2000). So, the SCREEN3 cavity zone model is not suitable for an estimate of actual HAP exposure. Moreover, no mention of how building data will be collected or applied is presented. A default procedure that uses a hypothetical cavity concentration could add more conservatism to the Proposal.

2.12 THE PROPOSAL'S OVERPREDICTION OF ACTUAL HAP IMPACTS IS COMPOUNDED BY RELIANCE ON OTHER ASSUMPTIONS AND HYPOTHETICALS.

The conservatism and concerns discussed in the foregoing comments illustrate a fundamental concern with the Proposal, and why it is not suitable for making a finding that emissions from a source or source category "results in" adverse effects. There are additional examples of the Proposal's reliance on assumptions and hypotheticals, rather than real-world data for sources. These include the following:

1. The Proposal (p. 4) states, “[o]ften times, the process area boundary is irregular in size and shape. In these cases, the closest boundary area to the stack will be selected.” This method inappropriately uses the overall closest boundary distance as the closest receptor distance in all directions, even though the actual closest distance in most directions will be larger.
2. The Proposal (p. 4) states, “[a]ll sources will be evaluated at a unit emission rate of 1 gram per second (g/s).” Inaccurate outdoor concentration predictions will result for reactive HAPs with other than a concentration dependent transformation rate.
3. The Proposal (p. 5) states, “[i]f it cannot be determined which stack emits which pollutant, then a representative point will be selected using conservative objective criteria.” This repeated application of conservatism upon conservatism yields unrealistic outdoor air concentrations.

3. PRACTICAL IMPLICATIONS

Virtually each individual concern identified in this Report is sufficient, by itself, to preclude the ADEQ Director from using the Proposal to make a scientifically valid finding that a source category “results in” adverse effects. When the effects of these multiple conservative features in the Proposal are combined, the problem is significantly compounded. This result is illustrated by Figure 1-1 presented in the Introduction to this Report and repeated below as **Figure 3-1**. **Figure 3-1** illustrates that the combined effect of the various conservative elements discussed in Section 2 of this Report will significantly overpredict actual exposure. By multiplying together the conservatism in the issues studied, the Proposal is shown to potentially overpredict from 1,000 to 60,000 times the actual human exposure for some HAP sources.

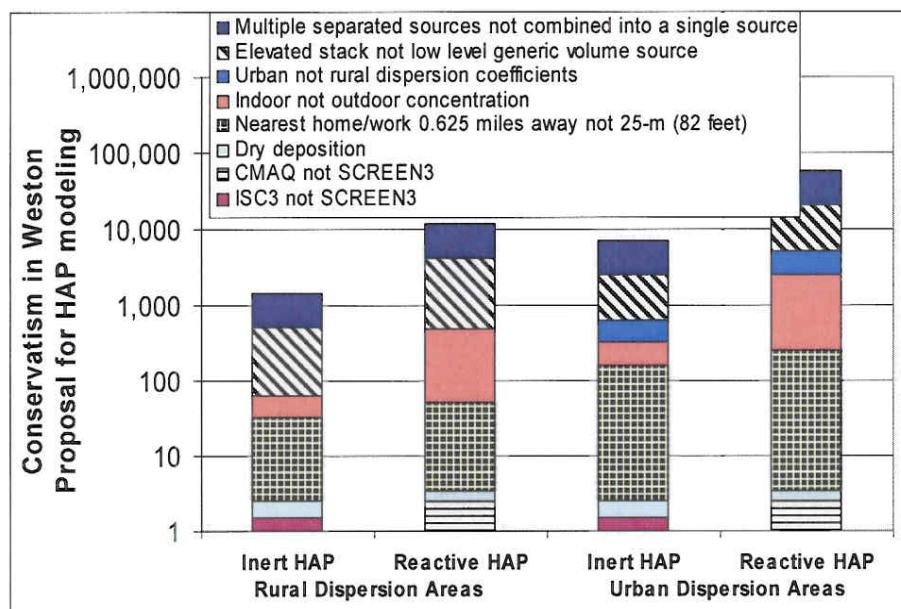


Figure 3-1. Estimated conservatism in Proposal modeling method.

This excessive conservatism also can be illustrated by using the commonplace example of benzene emissions from a large gasoline station. Actual benzene emissions were assumed to be 0.29 t/y, as reported from a large Denver gas station (Hancock III, 1993). Based on the methodology in the Proposal, this benzene emission rate would expose humans to an $84 \mu\text{g}/\text{m}^3$ maximum annual average benzene concentration at 25-m. This predicted impact for a single gas station’s impact on the public air in Phoenix is over 300 times Weston’s proposed adverse chronic health effect level of $0.243 \mu\text{g}/\text{m}^3$ for benzene. In other words, application of the Proposal suggest that the human cancer risk from a single gas station as 300 in 1 million. This exceeds estimates of a combined cancer risk for South Phoenix residents of 100 in 1 million (EPA, 2005e). Arizona HAP studies (EPA, 2005e) attribute this risk to broadly distributed on-road mobile sources and industrial emissions in South Phoenix. These comparisons highlight the over conservative nature of the Proposal.

Similarly, according to ADEQ’s actual ambient air measurements in 1995, the average concentration of benzene in the Phoenix urban air was only $8.0 \mu\text{g}/\text{m}^3$ -- ten times less than the

84 $\mu\text{g}/\text{m}^3$ concentration predicted by the Proposal for a single gas station. ADEQ, "Arizona Hazardous Air Pollutant Research Program," Vol. 2, p. 3-14 (Dec. 1995). ADEQ's measured concentration reflected actual benzene impacts from multiple benzene sources (including vehicle exhaust from Phoenix traffic). The contrast between ADEQ's *measured* benzene concentration resulting from *multiple* urban sources (8.0 $\mu\text{g}/\text{m}^3$) and the benzene concentration *estimated* using the Proposal's formula for a *single* large gas station source (84 $\mu\text{g}/\text{m}^3$) is dramatic and illustrates the overly conservative nature of the Proposal.

4. CONCLUSION

Based on multiple conservative assumptions and features, the Proposal will seriously overpredict the HAP impact of a source or source category on the ambient air. For that reason, it would not provide a scientifically valid basis for a finding by the ADEQ Director that emissions from a source or source category “result in” adverse effects to human health or the environment.

5. REFERENCES

Arizona Department of Environmental Quality (ADEQ) (2004). Air Dispersion Modeling Guidelines for Arizona Air Quality Permits. Arizona Department of Environmental Quality, Phoenix, Arizona. December 2004.

Arizona Department of Environmental Quality (ADEQ) (2005a). Arizona DEQ – Development of Acute Health-Based Ambient Air Criteria. Web site: <http://www.azdeq.gov/function/laws/download/hapsacute.pdf> .

Arizona Department of Environmental Quality (ADEQ) (2005b). Arizona DEQ – Development of Chronic Ambient Air Concentrations (Long-Term). Web site: <http://www.azdeq.gov/function/laws/download/hapsambient.pdf> .

Ching, J., T. Pierce, T. Palma, W. Hutzell, R. Tang, A. Cimorelli, and J. Herwehe (2004). Application of fine scale air toxics modeling with CMAQ to HAPEM5. 2004 CMAS Workshop, Session 5 on fine-scale modeling, exposure and risk assessments.

Environmental Defense (2005). Scorecard. The Pollution Information Site. Web Site: < http://www.scorecard.org/env-releases/hap/emissions.tcl?geo_area_id=04&geo_area_type=fips_state_code >

Gifford, F.A. and Hanna, S.R. (1973). Modeling urban air pollution. Atmospheric Environment. (7):131-136.

Hancock III, R. (1993). HAP emissions from gasoline service stations. Memorandum. Memo # PS93-007. To Permit Section Staff. December 6.

Hanna, S.A., Briggs, G.A., and Hosker, R.P. (1982). Handbook on Atmospheric Diffusion. Available as DE82002045 (DOE/TIC-11223) from the National Technical Information Service, U.S. Department of Commerce, Springfield, VA, 22161, 108 pages.

Johnston R., Burge H., Fisk W. (2000). Clearing the Air: Asthma and Indoor Air Exposures. Report from the Committee on the Assessment of Asthma and Indoor Air. Institute of Medicine. Washington, DC: National Academy Press.

Kulkarni, A. and McNally, M. (2000). A Microsimulation of Daily Activity Patterns. Institute of Transportation Studies Center for Activity Systems Analysis (University of California, Irvine). This paper is posted at the eScholarship Repository, University of California. Web site: <http://repositories.cdlib.org/itsirvine/casa/UCI-ITS-AS-WP-00-7> .

Lawrence Berkeley National Laboratory (2003). Understanding the Indoor Concentrations of Outdoor Aerosols in Residences. Summer 2003. Newsletter. Web site: <http://eetd.lbl.gov/newsletter/nl14/ResidenceAerosols.html> .

Liu L., P. Koutrakis, H. Suh, J. Mulik, and R. Burton (1993). Environmental Health Issues. Environmental Health Perspectives Volume 101, Number 4, September.

New Mexico Air Quality Bureau (2003). Dispersion Modeling Guidelines. Revised. July.

Oklahoma Air Quality Division (2003). Air Dispersion Modeling Guidelines For Oklahoma Air Quality Permits. Prepared by the Engineering Section of the Permitting Unit Air Quality Division of the Oklahoma Department of Environmental Quality. July.

Texas Commission on Environmental Quality (2004a). New Regulatory Air Dispersion Models. Web site: http://www.tnrc.state.tx.us/permitting/airperm/nsr_permits/admt/druggeri-rvd11_14_02.pdf; last accessed October 21.

Texas Commission on Environmental Quality (2004b). Revised Modeling Protocol for the Beaumont-Port Arthur Area Attainment Demonstration. March.

U.S. Environmental Protection Agency (1985). Ambient Air. May 18.

U.S. Environmental Protection Agency (1986). Receptor Locations in Ambient Air. January 21

United States Environmental Protection Agency (1995a). User's Guide for the Industrial Source Complex (ISC3) Dispersion Models, Volume 1 – User's Instructions. U.S. EPA, Office of Air Quality Standards, Emissions, Monitoring and Analysis Division, Research Triangle Park, North Carolina. September 1995. EPA-454/B-95-003a.

United States Environmental Protection Agency (1995b). SCREEN3 Model User's Guide. U.S. EPA, Office of Air Quality Planning and Standards Emissions, Monitoring, and Analysis Division, Research Triangle Park, NC. September 1995. EPA-454/B-95-004

United States Environmental Protection Agency and the United States Consumer Product Safety Commission Office of Radiation and Indoor Air (1995). "The Inside Story: A Guide to Indoor Air Quality" (6604J) EPA Document # 402-K-93-007, April.

United States Environmental Protection Agency (1996). Guideline on Air Quality Models (Revised), U.S. EPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC. Appendix W of 40 CFR Part 51, August 1996.

United States Environmental Protection Agency (2003). Appendix W to Part 51 – Guideline on Air Quality Models. July 1.

United States Environmental Protection Agency (2005a). Modeled Ambient Concentrations. U.S. EPA Technology Transfer Network, National Air Toxics Assessment. Web site: <<http://www.epa.gov/ttn/atw/nata/natsa2.html>>.

United States Environmental Protection Agency (2005b). What Human Exposure Data and Models are Available? Web site: <<http://www.epa.gov/OSP/presentations/airtox/ozkaynak.pdf>>.

United States Environmental Protection Agency (2005c). Further Technical Details about HAPEM4. Web site: < <http://www.epa.gov/ttn/atw/nata/modelexp.html> >.

United States Environmental Protection Agency (2005d). Comparison of ASPEN Modeling System Results to Monitored Concentrations. Web site: < <http://www.epa.gov/ttn/atw/nata/draft6.html#secIV.B.ii.a.2> >.

United States Environmental Protection Agency (2005d). Phoenix Area Monitoring for the Joint Air Toxics Assessment Project (JATAP). Web site: < <http://www.epa.gov/ttnamti1/files/ambient/airtox/fyo4pho.pdf#search='phoenix,%20az%20benzene%20emissions'> >.

Wallace L., H. Mitchell, G. O'Connor, L. Neas, M. Lippmann, M. Kattan, J. Koenig, J. Stout, B. Vaughn, D. Wallace, M. Walter, K. Adams, and L. Liu (2003). Particle Concentrations in Inner-City Homes of Children with Asthma: The Effect of Smoking, Cooking, and Outdoor Pollution. Environmental Health Perspectives Volume 111, Number 9, July.

APPENDIX A

AUTHOR CREDENTIALS

PATRICK ALLEN RYAN, Ph.D.

Senior Air Quality Analyst
8170 East Del Cadena Drive
Scottsdale, AZ 85258
480/994-5649
Fax: 480/994-5649
e-mail address: pryan01@cox.net

Experience: Over the past 15 years, Dr. Ryan has modeled PSD, NAAQS, and haze compliance of mines, cement, smelters, power plants, crushing and screening, and hot mix asphalt emissions in Arizona, California, New Mexico, other western States and nationwide.

Dr. Ryan helped develop a site-specific dispersion model for use around a facility. By showing this site-specific model was more accurate than EPA regulatory models, EPA agreed to its use for the facility.

He responded to a facility request for demonstrating PM₁₀ NAAQS compliance. The demonstration reduced levels of conservatism in the ADEQ early report.

Dr. Ryan was hired by the U.S. Department of Justice to estimate emission benefits from EPA moving to 2002 from 2007 a heavy-duty diesel truck emission regulation. He responded to criticism's leveled by industry consultants that emission benefits of the rule were insignificant.

He has compiled many fugitive dust emission inventories. He has estimated the effectiveness of fugitive controls. He has determined Best Available Control Technology (BACT) for a power plant, crushing and screening plants, and VOC emitting plant.

Education: Ph.D. Chemical Engineering, University of California, Los Angeles, 1990
Minors in Mathematics and Numerical Simulation
Thesis: *Theoretical Studies of Mass Transport in the Unsaturated Soil Zone.*

M.S. Chemical Engineering, University of California, Los Angeles, 1986
Thesis: *Multimedia Modeling of Environmental Transport.*
B.S. Engineering, University of California, Los Angeles, 1983

Outstanding Ph.D. Award, UCLA School of Engineering, 1988-1989

Journal Articles

Ryan, P., Lowenthal, D., and N. Kumar (2005). Improved Light Extinction Reconstruction in IMPROVE. Accepted for publication *J. Air & Waste Manag. Assoc.* November, Special Visibility Issue.

- Ryan, P. (2005). Precipitation in Light Extinction Reconstruction. *J. Air & Waste Manag. Assoc.* July 1.
- Chinkin L.R., Coe D.L., Funk T.H., Hafner H.R., Roberts P.T., Ryan P.A., and Lawson D.R. (2003) Weekday versus weekend emissions activity patterns for ozone precursor emissions in California's South Coast Air Basin. *J. Air & Waste Manag. Assoc.* July 1.
- Ryan P.A. (1993) Review of mathematical models for health risk assessment IV - Intermedia chemical transport. *Env. Software.*
- Cohen Y. and Ryan P.A. (1990) Chemical transport in the top soil zone - the role of moisture and temperature gradients. *J. Haz. Mat.*
- Ryan P.A. and Cohen Y. (1989) Multiphase chemical transport in soils. In *Intermedia Pollutant Transport: Modeling and Field Measurements*, Allen DT, Kaplan J.R., and Cohen Y. (eds). Plenum Press.
- Cohen Y., Taghavi H., and Ryan P.A. (1988) Contaminant diffusion under non-isothermal conditions in nearly dry soils." *J. Env. Qual.* **17**, 198.
- Ryan P.A. and Cohen Y. (1986) Multimedia transport of particle-bound organics: benzo(a)pyrene test case. *Chemosphere*, **15**, 21-47.
- Cohen Y. and Ryan P.A. (1985) Mass transfer across wind-sheared interfaces. *Int. Comm. Heat Mass Transfer*, **12**, 139.
- Cohen Y. and Ryan P.A. (1985) Multimedia modeling of environmental transport: trichloroethylene test case. *Env. Sci. Tech.*, **19**, 142.

Meeting Presentations and Conference Proceedings

- Ryan, P., Lowenthal, D., and N. Kumar (2005). Should IMPROVE Light Extinction Reconstruction be IMPROVED. EUEC Conference, January 25, 2005 – Tuscon, AZ.
- Ryan, P. and N. Kumar (2004). Uncertainty Analysis of the EPA Default Approach for the Regional Haze Rules. AWMA Regional and Global Perspectives on Haze: Causes, Consequences and Controversies. Visibility Specialty Conference, October 27, 2004 - Asheville, NC.
- Ryan, P. and N. Kumar (2004). Review of the U.S. EPA Default Implementation Guideline for the Regional Haze Rule. EUEC Conference, January 21, 2004 – Tuscon, AZ.
- Lowenthal, D., P. Ryan, N. Kumar (2003). Aerosol Extinction Assessment and Impact on Regional Haze Rule Implementation. RPO National Workgroup Meeting, November 4 - 6, 2003 – St. Louis, MO.
- Brown S.G., Hafner H.R., and Ryan P.A. (2003) Nitrogen Deposition into the Casco Bay Estuary, Maine. Paper and presentation prepared for the Air & Waste Management Association's 96th Annual Conference & Exhibition, San Diego, CA, June 22-26, 2003 (STI-2327).
- Brown S.G., Main H.H., and Ryan P.A. (2002) Mercury deposition into the Casco Bay Estuary, Maine. Presented at the NADP Scientific Symposium, Seattle, WA, September 11 (STI-2248).
- Wheeler N.J.M., Lurmann F.W., Ryan P.A., Roney J.A., Roberts P.T., MacDonald C.P., Chinkin L.R., Coe D.L., Hanna S., Seaman N., Hunter G., and Scalfano D. (2001) The SO₂ and NO₂ increment analysis for the Breton National Wilderness Area. Presented to the Minerals Management Service and Scientific Review Board, New Orleans, Louisiana, December 13, STI-901369-2135.
- Coe D.L., Ryan P.A., Funk T.H., and Chinkin L.R. (2001) DOE/OHVT weekday-weekend study: Emissions activity results. Presented at the Weekday/Weekend Effect Workgroup, California Air Resources Board, Sacramento, CA, October 23, STI-999677-2124.
- Kendall, S., J. Smith, P. Ryan, R. Paine, S. Andersen, and A. Bealer. (1998). An Evaluation of the Mesoscale Puff Dispersion Model for Application to the Good Engineering Stack Height Review of the Phelps Dodge Hidalgo Smelter. Paper presented at the *Air & Waste Management Association 10th Joint Conference on the Applications of Air Pollution Meteorology*, Phoenix, AZ, January 11-16.
- Ryan, P. and S. Kendall. Regional Haze. (1998). Paper presented at the *Air & Waste Management Association 10th Joint Conference on the Applications of Air Pollution Meteorology*, Phoenix, AZ, January 11-16.
- Bealer, A., P. Ryan, and S. Kendall. (1998). Design Concentration Differences associated with Temporal and Spatial Variations in Meteorological Tower Data. Paper presented at the *Air & Waste Management Association 10th Joint Conference on the Applications of Air Pollution Meteorology*, Phoenix, AZ, January 11-16.
- Ryan, P., S. Kendall, J. Smith. (1996). Parameterization of the Unstable Atmosphere. Paper presented at the *Air & Waste Management Association 9th Joint Conference on the Applications of Air Pollution Meteorology*. Atlanta, GA. January 28-February 2.

- Chinkin L.R., Ryan P.A., and Reiss R. (1995). A critical evaluation of biogenic emission systems for photochemical grid modeling in California. Paper presented at the *Air & Waste Management Association and U.S. Environmental Protection Agency Emissions Inventory Conference, Research Triangle Park, NC, October 11-13*, (STI-1541).
- Moore, G., P. Ryan, D. Schwede, and D. Strimaitis. (1994). Model Performance Evaluation of Gaseous Dry Deposition Algorithms. (1994). Paper presented at the *Air & Waste Management Association 87th Annual Meeting & Exhibition*.
- Pai, P., S. Heisler, A. Venkatram, and P. Ryan. (1993). Emissions of Trace Metals and Chloride in the United States and Canada. Paper presented at the *International Conference on Emission Inventory: Perception and Reality*.
- A. Venkatram, G. Kuntasal, P. Ryan, P. Karamchandani, and P. Saxena. (1991). Analyzing Observations of Precipitation and Ambient Concentrations of Sulfur Using a Semi-Empirical Long-Range Transport Model. Paper presented at the *Air & Waste Management Association 84th Annual Meeting & Exhibition. June 16-21*.
- Cohen, Y. and P.A. Ryan. (1989). NAPL and Contaminant Transport in the Soil Matrix. Paper presented at the *ASCE Environmental Engineering Conference. Austin, TX. July 10-12*.
- Ryan, P.A. and Y. Cohen. (1986). Contaminant Diffusion in the Top Soil Zone - The Equilibrium Assumption Revisited. Paper presented at the *American Chemical Society Annual Meeting, Anaheim, CA. September 7-12*.
- Taghavi, H., P.A. Ryan, and Y. Cohen. (1986). Contaminant Transport under Non-Isothermal Conditions in the Top Soil. Paper presented at the *American Chemical Society Annual Meeting, Anaheim, CA. September 7-12*.
- Cohen, Y. and P.A. Ryan. (1985). Multimedia Distribution of Pollutants in the Environment. Paper presented at the *Northwest American Chemical Society Regional Meeting. Sun Valley, ID. June 18-20*.
- Cohen, Y. and P.A. Ryan. (1985). Environmental Distribution of Aerosol-bound Pollutants. Paper presented at the *American Chemical Society National Meeting. Miami, FL. April 28 - May 3*.
- Cohen, Y. and P.A. Ryan. (1984). Multimedia Modeling of Environmental Transport: Trichloroethylene Test Case. Paper presented at the *American Institute of Chemical Engineers Annual Meeting, San Francisco, CA, November 25-30*.

TAB 5

DE MINIMIS LEVELS

**AUTHORITY TO ESTABLISH DE MINIMIS LEVELS FOR
FEDERAL HAZARDOUS AIR POLLUTANTS**

BACKGROUND

The Arizona Department of Environmental Quality (ADEQ) is developing a rule to implement a state hazardous air pollutant (HAP) program pursuant to A.R.S. §§ 49-426.04 *et seq.*, as enacted in 1992 and amended in 1995 and 1996 (State HAP Statutes). The State HAP Statutes state, “the director shall by rule establish a state program for the control of hazardous air pollutants that meets the requirements of this section.” A.R.S. § 49-426.06(A).

For purposes of the State HAP Statutes, the list of State HAPs automatically includes “[f]ederally listed hazardous air pollutants.” A.R.S. § 49-426.04(A)(2). In addition, the ADEQ Director may add other pollutants to the State HAP list if they meet certain strict, scientific criteria. A.R.S. § 49-426.04(A)(1).

The State HAP Statutes use the term “de minimis amounts” but they do not define it. Furthermore, the State HAP Statutes use this term in only one section, under the heading “State program for control of hazardous air pollutants”:

B. After rules adopted pursuant to subsection A of this section become effective pursuant to § 41-1032, a person shall not commence the construction or modification of a source that is subject to this section without first obtaining a permit or permit revision that complies with § 49-426 and subsection C or D of this section. For purposes of determining whether a change constitutes a modification, **the director shall by rule establish appropriate de minimis amounts for hazardous air pollutants that are not federally listed hazardous air pollutants.** In establishing de minimis amounts, the director shall consider any relevant guidelines or criteria promulgated by the administrator.

* * *

C. . . . A permit or permit revision issued to a new or modified source that is subject to the state hazardous air pollutant program under subsection A, paragraph 2 of this section shall impose hazardous air pollutant reasonably available control technology for the new source or modification, **Standards imposed pursuant to this subsection shall apply only to hazardous air pollutants emitted in amounts exceeding the de minimis amounts established by the administrator or by the director pursuant to subsection B of this section.**

A.R.S. § 49-426.06(B) & (C) (emphasis added). The “administrator” is the Administrator of the U.S. Environmental Protection Agency (EPA). A.R.S. § 49-401.01(1).

A.R.S. § 49-426.06 authorizes the ADEQ Director to establish de minimis levels for State HAPs that are not federally listed HAPs. It does not authorize the ADEQ Director to establish de minimis levels for federally listed HAPs. A.R.S. § 49-426.06 contemplates that the EPA Administrator is the official who can establish any de minimis levels for federally listed HAPs.

The EPA Administrator has not established de minimis levels for federally listed HAPs. EPA ultimately decided not to establish de minimis levels for federal HAPs. EPA abandoned the effort in late 1995, because it was “extremely controversial” and EPA decided that the public could be protected instead by regulating newly constructed and reconstructed HAP facilities, rather than regulating modifications that involved an increase of HAP emissions above HAP de minimis levels. Letter from EPA Assist. Administrator Mary Nichols to Hon. Joe Barton dated December 18, 1995.

EPA’s decision in 1995 to not establish de minimis levels for federally listed HAPs now requires consideration of whether the ADEQ Director has authority to establish de minimis levels for federally listed HAPs for purposes of the State HAP program. At least two views have been expressed by different stakeholders:

(1) The ADEQ Director does have the authority to establish de minimis levels for federal HAPs, based on statutory provisions outside of the State HAP Statutes (*i.e.*, A.R.S. §§ 49-401.01(24), 49-425, 49-426); and

(2) The ADEQ Director does not have the authority to establish de minimis levels for federal HAPS unless the Legislature amends the State HAP Statutes to grant the authority.

Arizona statutes and case law demonstrate that the second view is correct.

DISCUSSION

ADEQ’s proposal to establish de minimis standards for federally listed HAPs is unauthorized for two reasons: first, § 49-426.06(B) limits ADEQ’s power to set de minimis levels to non-federally listed HAPs; and second, the limitation on ADEQ’s authority to establish de minimis standards found in § 49-426.06(B) within the State HAP Statutes controls over any alleged general grant of authority outside of the State HAP Statutes.

A. ADEQ Is Without Power to Set De Minimis Levels For Federally Listed HAPs Because the Legislature Expressly Limited ADEQ’s Power to Adopt HAP De Minimis Levels for Non-Federally Listed HAPs.

ADEQ is without power to adopt de minimis levels for federally listed HAPS because such action is outside of the parameters of its statutory grant of authority. A.R.S. § 49-426.06(B) defines ADEQ’s power to set de minimis levels for purposes of the State HAP Statutes. It provides, in relevant part, that “[f]or purposes of determining whether a change constitutes a modification, the director shall by rule establish appropriate de minimis amounts for hazardous air pollutants **that are not federally listed hazardous air pollutants.**” (Emphasis added).

The Legislature unmistakably intended to limit ADEQ's authority to set de minimis levels to non-federally listed HAPS for purpose of the State HAP program. Although the decision by EPA to not promulgate de minimis standards for federally listed HAPS has left a gap in the State HAP Program, constitutional principles require that this gap be filled (if filled at all) by the Legislature rather than ADEQ.

The issue here is one of both statutory construction and administrative law. When interpreting a statute, courts seek "to fulfill the intent of the legislature that wrote it." *City of Tucson v. Clear Channel Outdoor, Inc.*, 209 Ariz. 544, 547, 105 P.3d 1163, 1166 (2005). To determine that intent, Arizona courts look first to the language of the statute. *Bilke v. State*, 206 Ariz. 462, 90 P.3d 269, 271 (2003). Where statutory language is clear and unambiguous, courts are bound by the expressed intent of the Legislature. *Id.*

These principles are particularly compelling in the context of administrative law because administrative powers are derived solely from the legislative grant of authority as expressed in the authorizing statute. *The Corp. Comm'n of Arizona v. Betts*, 63 Ariz. 257, 261-62, 161 P.2d 110, 112 (1945). It is a fundamental principle of administrative law that a state agency must function in the exercise of its rule-making authority within the parameters of its statutory grant. *Kennecott Copper Corp. v. Industrial Comm'n of Arizona*, 115 Ariz. 184, 186, 564 P.2d 407, 409 (Ariz. App. 1977). Any excursion beyond the legislative limits would be an administrative usurpation of the constitutional authority of the legislature. *Id.* Where the authority of an administrative agency is limited by the authorizing statute, the agency has no right "to shut their eyes to plain provisions of the statute." *Swift & Co. v. State Tax Comm'n*, 105 Ariz. 226, 230, 462 P.2d 775, 789 (1969). Thus, even where a state agency exercises "plenary power" over certain aspects of its jurisdiction, it has no authority to exercise powers clearly denied to it by the authorizing statute. *Betts*, 63 Ariz. at 263, 161 P.2d at 112.

The fact that a basic assumption of the statutory scheme failed—namely that EPA would establish de minimis standards for federally listed HAPS—does not change the analysis. Arizona courts generally hold that if a statutory scheme is frustrated because the Legislature "inadvertently" allows a gap, a state agency cannot legislate through its rulemaking. *Swift & Co.*, 105 Ariz. at 230, 462 P.2d at 779. Even where such a gap makes the statutory scheme "oppressive or unworkable, relief lies with the legislative department." *Id.* Therefore, the agency may not amend a statutory scheme by regulation. *Id.*

The Arizona Supreme Court recently applied these principles in *Arizona v. Hayden*, 115 P.3d 116 (2005) where it held that the Arizona Department of Economic Security ("ADES") exceeded its statutory grant of authority by extending the limitations period for collection of unpaid child support. The statutory scheme at issue limited extension of the limitations period to two specifically defined situations. *Id.* at 118. ADES argued that a broad statement of public policy in favor of parental accountability within the statute empowered it to craft a third overarching administrative exception to the limitations period at issue. *Id.* at 119. The Court disagreed, explaining:

When the legislature has expressly defined the narrow exceptions to the requirement to timely request a written judgment for support arrearages, we cannot read into the statute the kind of broad—and unstated—exception for which the State argues.

Id. at 118. The Court further explained that considerations of the overarching policy of the statutory scheme does not “justify ignoring specific statutory mandates enacted by the legislature.” *Id.* at 119. The Court concluded that ADEQ unlawfully exceeded its statutory grant of authority, noting that it was bound by the specific language of the statute and that arguments as to the wisdom of the statutory scheme “are appropriately directed to the legislature, not the courts.” *Id.* at 120.

Similarly, ADEQ’s authority to establish de minimis standards expressly is limited to State HAPS that are not federally listed HAPS. A.R.S. § 49-426.06(B) specifically addresses ADEQ’s authority to establish de minimis levels for HAPs. It only provides that ADEQ may establish de minimis levels for “hazardous air pollutants that are not federally listed hazardous air pollutants.” ADEQ cannot ignore this specific statutory limitation on its authority. Although EPA’s decision not to establish de minimis levels for federally listed HAPS arguably leaves an unanticipated gap in the statutory scheme, ADEQ may not assume legislative responsibility to fill that gap. Under Arizona law, even if a gap makes a statutory scheme “unworkable,” relief lies with the Legislature.

B. ADEQ May Not Establish De Minimis Levels for Federally-Listed HAPs Based on Statutes Outside of the State HAP Statutes Because the Specific Grant of Authority in A.R.S. § 49-426.06(B) Controls Over Any Alleged General Grant of Authority.

ADEQ may not set de minimis standards for federally listed HAPS under general statutes outside of the State HAP Statutes, because the specific provisions of A.R.S. § 49-426.06(B) control over any such general grant of authority. Unlike the statutes outside of the State HAP Statutes, § 49-426.06(B) specifically addresses ADEQ’s authority to establish de minimis standards for purposes of the State HAP program. As the only specific statute on the subject, § 49-426.06(B) controls.

Those stakeholders who argue that ADEQ has authority to adopt de minimis levels for federally listed HAPs in a State HAP rulemaking all rely on three statutes that are general statutes (*i.e.*, §§ 49-401.01(24), 49-425, 49-426), outside of the State HAPs Statutes. None of these general statutes overrides the Legislature’s specific expression of intent within the State HAPs Statute.

A.R.S. § 49-401.01 provides the general definition of “modification” under the Arizona air quality statutes, and the definition includes references to de minimis levels of “air pollutants.” Of course, this reference does not necessarily refer to federally listed HAPs, because “air pollutant” is a general term that can apply to many pollutants other than federal HAPs. *See* Arizona Administrative Code (A.A.C.) R18-2-101(88). Moreover, the definition of “modification” is found in a list of general definitions that the Legislature expressly restricted with these words in the introductory sentence to the definitions section: “In this chapter, *unless the context otherwise requires* . . .” A.R.S. § 49-401-01 (emphasis added). This language

recognizes that the specific provisions elsewhere in the air quality statutes (such as the State HAP Statutes) override the general definitions. The other two general statutes are found at A.R.S. §§ 49-425 (“Rules; hearing”) and 49-426 (“Permits”). They clearly are general provisions that apply to many types of sources and air pollutant emissions, not specifically or exclusively to the State HAPs program.

To argue that these general provisions grant State HAP rulemaking authority that is expressly withheld in the State HAP Statutes contravenes Arizona case law and the clear terms of A.R.S. § 49 1030(C)(2) prohibiting a general grant of rulemaking authority from supplementing a more specific grant of rulemaking authority. A basic principle of statutory interpretation instructs that specific statutes control over general statutes. *Mercy Healthcare Arizona, Inc. v. Arizona Health Care Cost Containment System*, 181 Ariz. 95, 100, 887 P.2d 625, 630 (Ariz. App. 1994); *see also Crystal Point Joint Venture v. Arizona Dept. of Revenue*, 188 Ariz. 96, 101, 932 P.2d 1367, 1372 (Ariz. App. 1997) (“a specific statute on point prevails over other more general statutes.”). Further, when a general and a specific statute conflict, the specific statute is treated as an exception to the general, and the specific statute controls. *Id.* These principles apply equally to statutory grants of authority to state administrative agencies. Therefore, where a specific grant of authority conflicts with a general grant of authority, the specific statute controls over the general statute. *See Facilitec, Inc. v. Hibbs*, 206 Ariz. 486, 80 P.3d 765 (Ariz. 2003). In addition, Arizona’s administrative procedures statute provides: “An agency shall not ... make a rule under a general grant of rule making authority to supplement a more specific grant of rule making authority.” A.R.S. § 41-1030(C)(2).

In contrast to the general statutes described above, the language defining and limiting ADEQ’s authority to establish de minimis levels *for hazardous air pollutants under the State hazardous pollutant program* is found in A.R.S. § 49-426.06, which is entitled “State program for control of hazardous air pollutants.” Whatever role or meaning the term “de minimis” might have outside of the State HAPs program, its role within the State HAPs program is defined and limited by A.R.S. § 49-426.06(B). The specific provisions of A.R.S. § 49-426.06(B) are controlling for all purposes of the State HAPs program. Therefore, for purposes of the State HAP program, the ADEQ Director is authorized to establish de minimis levels only for non-federally listed HAPs.

C. The Decision by EPA Not to Establish De Minimis Levels for Federal HAPs Does Not Necessarily Create an Unforeseen Gap in the State HAPs Program.

Some stakeholders who argue in favor of ADEQ’s authority to establish de minimis levels for federal HAPs assume that the Legislature had determined with certainty in 1992 that EPA would, in fact, establish de minimis levels for federal HAPs. The facts do not support that assumption.

When the Legislature enacted the State HAP Statutes in 1992, the new federal HAPs program under Congress’ 1990 Amendments to the federal Clean Air Act was less than three years old, and EPA had not yet proposed a HAP de minimis levels rulemaking. In fact, EPA did not propose a de minimis rule for federal HAPs until 1994. 59 Fed. Reg. 15,504 (April 1, 1994).

Then, as noted above, EPA announced in December 1995 that it would not establish de minimis levels for federal HAPs. Thus, the time period during which it appeared very likely that EPA would establish de minimis levels for federal HAPs was brief, running from April 1994 to December 1995.

This chronology demonstrates that de minimis levels for federal HAPs were not a certainty in 1992 when the Legislature enacted the HAPs statute. Equally important, it demonstrates that when the Legislature last amended the HAPs statute in 1996, it was public knowledge that EPA had decided not to establish de minimis levels for federal HAPs.¹

There is a plausible reason for the Legislature to leave the so-called gap in place. It has to do with the strict scientific studies and demonstrations that the ADEQ Director must make in order to add a pollutant to the State HAPs list. A.R.S. § 49-426.04(1) sets forth strict and demanding scientific criteria that ADEQ must satisfy in order to have authority to list a pollutant as a State HAP. If ADEQ has gathered and analyzed the data, conducted the studies, and made the scientific demonstrations required in order to list a pollutant as a State HAP, then ADEQ likely also will have the data and first-hand knowledge needed to establish a fair and scientifically sound de minimis level for that State HAP.

In contrast, since the federal HAPs automatically are included in the State HAP list by operation of the statutory definition, it is not necessary for ADEQ to undergo rigorous scientific investigations, studies, and findings with respect to the pollutants that are federal HAPs. Therefore, it is reasonable that the Legislature concluded that the ADEQ Director should not establish de minimis levels for federal HAPs, because there is no assurance that ADEQ has the data or expertise needed to make scientifically sound decisions for federal HAPs.

The question may be asked as to how the public health interest can be protected now that EPA has declined to establish de minimis levels for federal HAPs and ADEQ is not authorized to do so. The answer is that ADEQ must return to the Legislature to seek an amendment of the State HAP Statutes that would expressly authorize the ADEQ Director to establish de minimis levels for federal HAPs. This would enable the Legislature to impose statutory criteria ensuring that, prior to establishing de minimis levels for federal HAPs, ADEQ must conduct the same type of rigorous scientific study and analysis that the statutes require for State HAPs that are not federal HAPs, thus ensuring that ADEQ's de minimis determinations for federal HAPs are scientifically sound.

¹ Under Arizona law, the Legislature is presumed to know existing law when it reenacts or amends a statute. *Wareing v. Falk*, 182 Ariz. 495, 500, 897 P.2d 1381, 1386 (Ariz. App. 1997). Pursuant to this principle, where administrative action or inaction leaves a "gap" in a statutory scheme, the failure of the legislature to address the gap in subsequent amendments creates a presumption that the gap was intentional. *See Estate of Jane W. Mason v. Cruce*, 190 Ariz. 312, 314-15, 947 P.2d 886, 888-89 (Ariz. App. 1997). Likewise, in this case the Legislature is presumed to have known that EPA abandoned its rulemaking plans to establish de minimis levels for Federal HAPS. Thus, Arizona courts will presume that the Legislature intended to retain the gap in the State HAP program.

CONCLUSION

The ADEQ Director does not have authority to establish de minimis levels for federally listed HAPs for purposes of the State HAP program. This conclusion is supported by the express language of the State HAP Statutes, Arizona case law, and A.R.S. § 49-1030(C)(2). In the absence of EPA's de minimis levels for federal HAPs, the Legislature apparently intends for ADEQ to return and request a specific grant of legislative authority in order to ensure that the grant is accompanied with appropriate scientific and evidentiary criteria.

TAB 6

STATE HAP EMISSIONS CAP

ESTABLISHMENT OF A HAPS EMISSIONS CAP

The Arizona Department of Environmental Quality's (ADEQ) Strawman Draft of "Related Rule Revisions" fails to include revisions to A.A.C. R18-2-306.02, which sets forth the procedure for establishing an emissions cap for particular conventional pollutants. Because the state hazardous air pollutant (HAP) program has the potential over time to apply to a wide variety of sources, it is important that ADEQ clarify that the voluntary emission cap provisions in A.A.C. R18-2-306.02 are available to cap emissions of HAPs the same as they are available to cap the emissions of conventional pollutants. In fact, ADEQ should clarify the emissions cap provisions in a number of important respects. The suggested improvements are included in the attached Joint Business Strawman Proposal. These clarifications incorporate HAPs into the emission cap provisions, make explicit that the emission cap can include pre-approved modifications, and specify the format of notifications the source must make to ADEQ before making a pre-approved change. Without these changes, a source subject to the state HAPs program that requires operational flexibility will be unable to ensure such flexibility. Moreover, the operational flexibility provided by the current provisions of A.A.C. R18-2-306.02 for conventional pollutants will be of little value, since they would not apply to all the regulated pollutants potentially emitted by the source.

The establishment of a HAPs emission cap raises some additional challenges that do not arise when dealing with conventional pollutants, however, these changes are not insurmountable and have been handled successfully in emission caps. For example, one issue with HAPs is how to establish a pre-determined allowable emissions level that will be sufficiently protective to keep a source's emissions below the applicable ambient air concentrations. This can be achieved by setting a total HAPs emissions cap in tons per year that takes into account the ambient air concentrations and, if necessary, sets sub-emission cap limits for sub-groups of HAPs types (e.g., gas/particulate or organic/inorganic) or specific HAPs. The source can then demonstrate through the use of EPA approved air dispersion modeling programs that emissions of X tons of any HAP in the group or subgroup will not cause an exceedance of the established ambient air concentration for that HAP or HAP subgroup. For any HAP where the modeling shows that the overall HAP emission cap will not impact the ambient air concentrations at X, the emission cap should be set at X. Any physical change or change in the method of operation of the source should not be considered "modifications" as long as emissions of the given HAP or HAPs remain below X.

If it is determined through modeling that an emission rate of X can cause an exceedance of an ambient air concentration for a given HAP, the emission cap for that specific chemical should be set under the emission cap at a lower value that would not cause an exceedance. In that situation, permitted emission limits might read as follows:

Cap Emission Limits (example)

Total HAPs	10 tons per year
Any individual HAP	9 tons per year
HAP A	6 tons per year
HAP B	5 tons per year
HAP C	500 lbs. per year

All HAPs not specifically identified in the emission cap example above would have a default individual limit of 9 tons per year, or whatever quantity is needed to keep the sum of all HAPs below the total combined limit of 10.

If the ambient air concentration for a HAP is revised during the term of the permit, the agency could include in the emissions cap the ability to re-model the HAP and, if necessary, reopen the permit to revise upward or downward the applicable emission cap for that HAP. Similarly, if the agency revises the state HAP list during the term of the permit to add a new state HAP, the agency could include in the emission cap a mechanism to evaluate the new state HAP, model emissions (if the new state HAP is emitted by the source), and reopen the permit to add the new state HAP to the emission cap. In addition, before the source could introduce a new HAP that was not considered in setting the initial emissions cap, the cap could be structured to require modeling of that new HAP to demonstrate that its emissions would not impact the ambient air concentrations at the applicable individual emission limit. Using the above example, it would be assumed that the HAP would be emitted at the maximum rate allowed by the permit (i.e., 9 tons per year). Ambient air concentrations could be modeled using an EPA approved air dispersion screening model. If the relevant standard would be exceeded under such circumstances, a HAP-specific emissions limit could be established so that emissions of that HAP would not result in an exceedance of the applicable standard. The same procedure could be followed if a permitted source wished to establish a limit for a chemical that it anticipated using in the future.

The emission cap also could require that ambient air modeling used to set the emission cap be repeated if future changes at the source cause one or more of the emission input parameters used in the modeling to change and the use of the revised input parameters would result in an increase in the ambient air concentration for those HAP emission affected by the future change. If reapplication of the modeling analysis indicates a potential for exceeding the relevant ambient air concentration, the procedures outlined above could be used to establish a revised emissions limit for the particular HAPs.

Finally, many HAPRACT or MACT requirements could likely be identified in advance (particularly where the source decides to rely on HAPRACT or MACT instead of an emissions modeling approach to demonstrate compliance with state HAPs program for a particular HAP). Treatment technologies for some chemicals are well established and unlikely to vary widely (e.g. wet scrubbing for corrosives, thermal oxidation for organics). Where standard technologies exist, that technology should be established in the emissions cap as HAPRACT for specific HAPs or classes of HAPs, particularly where the HAPRACT specified would meet a known performance standard (e.g., MACT).

TAB 7

MACT AND HAPRACT STANDARDS

HAPRACT REQUIREMENTS MAY NOT MANDATE THE USE OF CONTROL TECHNOLOGY MORE STRINGENT THAN MACT

In discussions during stakeholder meetings on the proposed HAPs rule, ADEQ stated that, in unusual circumstances, it may determine that HAPRACT requires the use of control technology that is more stringent than the technology defined as MACT. This cannot be the case.

Arizona law specifies that HAPRACT must not be incompatible with MACT.

Arizona's statutory requirements clearly and unambiguously require that HAPRACT standards may not impose requirements that are inconsistent with MACT standards.

- A.R.S. § 49-401.01.17 defines hazardous air pollutant reasonably available control technology (HAPRACT) as “an emissions standard for hazardous air pollutants which the director, acting pursuant to section 49-426.06, subsection C, or the control officer, acting pursuant to section 49-480.04, subsection C, determines is reasonably available for a source.”
 - The HAPRACT determination must “take into consideration the estimated actual air quality impact of the standard, the cost of complying with the standard, the demonstrated reliability and widespread use of the technology required to meet the standard and any non-air quality health and environmental impacts and energy requirements.” *Id.*
 - The HAPRACT “may be expressed as a numeric emissions limitation or as a design, equipment, work practice or operational standard.” *Id.*
- A.R.S. § 49.426.06.C requires that “[t]he director *shall not impose a standard under this subsection that would require the application of measures that are incompatible with measures required under a standard imposed pursuant to section 49-426.03, subsection B.*” (Emphasis added).
 - A.R.S. § 49-426.03.B.1 provides that “[n]o person may obtain a permit or permit revision to modify a major source of federally listed hazardous air pollutants or to construct a new major source of federally listed hazardous air pollutants, unless the director determines that the person will install *the maximum achievable control technology for the modification or new major source.*” (Emphasis added).
 - A.R.S. § 49-426.03.B.2 provides that “[a]fter the date specified by the administrator in rules adopted pursuant to section 112 (g)(1)(B) of the clean air act and until the administrator adopts emissions standards establishing the maximum achievable control technology for a source category or subcategory that includes a source subject to paragraph 1 of this subsection, the director shall determine the maximum achievable control technology for the modification of new major source on a case-by-case basis.”

- A.R.S. § 49-426.03.B.3 defines an alternative MACT as 90% controls for federal hazardous air pollutants (HAPs) or 95% for federal HAPs that are particulates.

The same statutory scheme applies to county air pollution control. See A.R.S. § 49-480.04.C (“The control officer shall not impose a standard under this subsection that would require the application of measures that are incompatible with measures required under a standard imposed pursuant to section 49-480.03, subsection A.”); A.R.S. § 49-480.03.A.1 (requiring the use of maximum achievable control technology).

ADEQ’s indication that it might impose HAPRACT requirements that are more stringent than MACT threatens to create an impossible scenario and would violate the established hierarchy of control technology and Arizona law.

The notion that HAPRACT can require more stringent control technology than MACT is unfounded. EPA has described the hierarchy between MACT and RACT standards as follows, allowing for equality in unusual circumstances but not for RACT to exceed MACT:

While typically MACT ("maximum") implies more stringent control than BACM ("best"), which in turn implies more stringent control than RACT ("reasonable"), the EPA recognizes that there may be isolated instances when there is such a limited range of controls for a specified industry or industry process that two or all three of these levels of control may be identical.

61 Fed. Reg. 44050, 44052 (August 27, 1996). See also, e.g., 64 FR 37773, 37778 (July 13, 1999):

The MACT is based on industry sources with the best performing emission reduction technology. While typically there may be differences in the level of emission reduction provided by MACT, BACM, BAC, and RACT, when there is a limited range of control options for a specified industry, such as coating technologies, the level of control may be identical.

It is only in unusual “isolated instances” – circumstances in which there is a very limited range of controls for an industry – that MACT and RACT may be identical. Normally, they are not even adjacent to each other in the hierarchy of control technologies. And it is never the case in which RACT may exceed MACT.

As noted, MACT standards are based on industry sources with the best performing emission reduction technology. It does not follow, as ADEQ has proposed, that RACT may require the use of technology more stringent than the best performing emission reduction technology. This is particularly true considering that, in determining HAPRACT, the Department “shall take into consideration the estimated actual air quality impact of the standard, the cost of complying with the standard, the demonstrated reliability and widespread use of the technology required to meet the standard and any non-air quality health and environmental impacts and energy requirements.” A.R.S. § 49-401.01(17) (emphasis added).

The elevation of RACT above MACT is inconsistent with the accepted hierarchy of control technology. Further, under ADEQ's proposal, a source may be required to install multiple technologies that may be incompatible or duplicative, or both. In the process, ADEQ threatens to force a facility to abide by either its MACT requirement or its HAPRACT requirement in a situation in which it cannot do both – in effect, ADEQ threatens to force a facility to violate a requirement imposed by law to install and operate specifically-defined MACT. Under the Arizona statutes cited above, ADEQ is expressly precluded from imposing such incompatible requirements.

ADOPTION OF MACT AND HAPRACT STANDARDS

The Arizona air quality statutes indicate that maximum achievable control technology (MACT) and hazardous air pollutant reasonably available control technology (HAPRACT) standards generally should be adopted through promulgation by rule, rather than decided in case-by-case permitting decisions.

The definitions of MACT and HAPRACT state that they are “standards.” A.R.S. §§ 49-401.01(17), 49-401.01(21). Under the federal and Arizona air quality programs, the word “standard” typically is used to describe promulgated requirements. Federal examples include National Ambient Air Quality Standards, New Source Performance Standards, National Emissions Standards for Hazardous Air Pollutants, and Emissions Standards for Moving Sources. Arizona examples include Existing Stationary Source Performance Standards and New Source Performance Standards. Another Arizona environmental statute equates “standard” with “a rule, ordinance or other regulation.” A.R.S. § 49-112.

Likewise, ADEQ’s statutory grant of rulemaking authority considers “standards” to be promulgated requirements. “The director . . . shall adopt, modify, and amend reasonable standards for the quality of, and emissions into, the ambient air of the state . . .” A.R.S. § 49-425. This statute is entitled “Rules; hearing.”

Under the portion of the Arizona air quality statute that addresses the federal hazardous air pollutant program (A.R.S. § 49-426.03(B)(2)), the statute recognizes that the “[EPA] administrator adopts emissions standards establishing the [MACT]”. The conventional method of establishing MACT standards under the federal program is by adoption of rules. *See* 40 C.F.R. 63. The few provisions for case-by-case MACT decisions are the exception, not the rule, and they are generally intended to be temporary. *Id.*

Under the portion of the Arizona air quality statute that addresses the Arizona hazardous air pollutant program (A.R.S. § 49-426.06(C)), the statute, after reciting MACT and HAPRACT definitions, states: “Standards imposed pursuant to this subsection ...” and “The director shall not impose a standard under this subsection ... that are incompatible with measures required under a standard imposed pursuant to 49-426.03, subsection B”, which is clearly a categorical MACT standard. Thus the word “imposed” is used to describe the establishment of both federal and Arizona standards. This contemplates that the Arizona standards be promulgated by rule, as are the federal standards.

Finally, the RMA process in A.R.S. § 49-426.06(D) is incompatible with a case-by-case MACT/HAPRACT determination. The statute requires that the RMA results be submitted to the Director “with the permit application for the new source or modification” and requires the Director to act on the application/RMA at that time. If MACT/HAPRACT is case-by-case, then the source cannot know what MACT/HAPRACT will be in advance and hence cannot submit the RMA “with the application” as intended by the statute.

These statutes indicate the Director generally should adopt HAPRACT and AZMACT standards through promulgation. ADEQ’s proposal to adopt them only through case-by-case permitting decisions should be reconsidered.

The process of promulgating HAPRACT and AZMACT standards by rule would be similar to the promulgation of federal MACT standards by the U.S. Environmental Protection Agency (EPA). ADEQ, sources, and public stakeholders could combine resources and efforts to develop an appropriate standard for each source category. ADEQ could establish a schedule for developing standards for source categories based on priorities and resources, just as EPA did for the MACT standards. Several standards could be under development at the same time. Once a standard is promulgated, it would apply to all new sources and modifications that fall within the source category.

The benefits of promulgating HAPRACT and AZMACT by rule rather than on a case-by-case basis include the following:

- Dramatically reduce the number of HAPRACT and AZMACT decisions that ADEQ must make.
- Enable public and private resources to be focused on one high-quality rulemaking for each source category, rather than fragmented and strung out in a never-ending series of case-by-case decisions .
- Enhance the ability of the public to participate in standard development, because there would be one process for each source category.
- Enable sources to design their projects to meet a known standard, thus expediting ADEQ's review and issuance of permits.
- Avoid the quandary of how a company, particularly a small company, would conduct a nationwide search of controls used by similar sources.
- Avoid the quandary of how a source would demonstrate through a Risk Management Analysis that HAPRACT or AZMACT is not needed to avoid adverse effects if a HAPRACT or AZMACT standard is not first established for that source's category.
- Ensure that sources within the same category are treated equally, so that there is a level economic playing field throughout the State.
- Enable Pima, Pinal, and Maricopa Counties to adopt ADEQ's standards, rather than expend County resources on a never-ending series of case-by-case decisions.

In summary, using rulemaking as the general method of establishing HAPRACT and AZMACT standards is consistent with Arizona statutes and regulations. It also would provide practical benefits.

TAB 8

RISK MANAGEMENT ANALYSIS

RISK MANAGEMENT ANALYSIS (RMA)

An approach similar to that described in ADEQ's strawman rule would be acceptable, with modifications that include the following:

(1) **De Minimis Amounts:** Don't use de minimis levels as the thresholds for those HAPs that are subject to RMA, since ADEQ's authority to adopt de minimis levels for federal HAPs is disputed. Instead, use a standard emission rate, such as 1.0 ton per year of a HAP, subject to ADEQ's ability to request inclusion of additional HAPs.

(2) **Modifications:** Don't require the RMA for a modification to include the entire potential to emit (PTE) of a source after the modification. Rather, use the emissions from the modification and/or net emissions increase approach used in the new source review program. ADEQ's approach would forever deprive some HAP sources from ever making a successful RMA demonstration--once a source's PTE was above a level that would result in a modeled impact above an AAC, no modification thereafter would ever be able to make a successful RMA demonstration.

(3) **Modeling:** See comments elsewhere on recommended modeling.

(4) **AACs:** See comments elsewhere on objections to ADEQ AACs.

(5) **Ambient Air/Process Area Boundary:** See comments elsewhere on objections to ADEQ's ambient air and process area boundary concepts.

(6) **Tier 4:** Tier 4 should be completely flexible, and not limited or constricted by rule with mandatory items for inclusion or exclusion. Flexibility should include, but not be limited to the ability to provide alternatives to the standard AACs.

(7) **Public Participation:** A significant permit revision should not be required automatically for all RMA exemptions. Whether a significant permit revision is required should depend solely on the criteria of the existing regulations governing changes at Class I and Class II facilities, in order to be internally consistent with the procedures that apply (or don't apply) to other exemptions under the air quality regulations. The HAPs statutes do not mandate public participation or a significant permit revision as requirements for a successful RMA demonstration; therefore ADEQ's proposal may be inconsistent with A.R.S. § 49-426.06(D). If public participation is required, it can be achieved in other ways, such as through an opportunity for public notice and comment.

TAB 9

APPENDIX



September 8, 2005

Nancy C. Wrona
Director, Air Quality Division
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, AZ 85007

RE: HAPs Rulemaking Implementation Issues

Dear Ms. Wrona:

The undersigned associations appreciate the opportunity to participate in stakeholder meetings with ADEQ on the proposed development of state hazardous air pollutants (HAPs) rules. In addition to the substantive comments that business stakeholders are expressing in the meetings, we are extremely concerned about rule implementation problems created by ADEQ's ambitious approach to roll out its proposed HAPs program in a few short months. The proposal has the potential to overwhelm the resources of ADEQ and local permitting agencies, which will harm existing businesses that wish to modify their facilities or new businesses that wish to locate in Arizona. There are no stakeholder meetings scheduled to discuss how to resolve the practical ramifications associated with the rule development.

For example, how ADEQ will make prompt and consistent hazardous air pollutant control technology (HAPRACT) determinations? How ADEQ will obtain resources to provide prompt and scientifically sound review of the complex toxicological and modeling issues presented when businesses start submitting risk management analyses to demonstrate that HAPRACT is not necessary to prevent adverse effects at their sites? Under the modeling methodology proposed by ADEQ's contractor, numerous source categories will become immediately subject to the new HAPs rule, creating a serious risk of air permit gridlock if ADEQ does not have a sound implementation strategy.

The scope of the initial rule rollout also appears to have the great potential to divert ADEQ's finite resources from other important tasks such as adopting federally mandated NSR reforms and moving forward with redesignations for numerous areas that are designated nonattainment but have been meeting ambient air quality standards for several years. Redesignating these areas would help correct the misunderstanding held by some that Arizona's air quality is deteriorating, would provide demonstrable results of the agency's many successful efforts to improve air quality, and would relieve an unnecessary burden on Arizona businesses.

We believe full, open and meaningful discussion is necessary to develop a rule that can be implemented as a practical matter and that will result in demonstrable environmental benefits. To help facilitate this dialogue, we have attached a list of implementation questions prepared by

interested members that we request the agency to address. We request that discussions of these issues be incorporated into the stakeholder process.

We appreciate your consideration of and response to these issues that are of great importance to Arizona businesses.

Sincerely,

ARIZONA ASSOCIATION OF INDUSTRY



James Tunnell, Vice President of Policy and Operations

ARIZONA CHAMBER OF COMMERCE



James J. Apperson, CEO and President

ARIZONA ELECTRONICS ASSOCIATION



Cory Miller, Executive Director

ARIZONA MINING ASSOCIATION



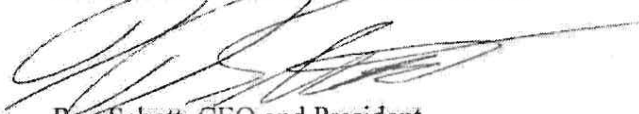
Sydney Hay, Executive Director

ARIZONA ROCK PRODUCTS ASSOCIATION



Russell "Rusty" Bowers, Executive Director

ARIZONA TECHNOLOGY COUNCIL



Ron Schott, CEO and President

ASSOCIATED GENERAL CONTRACTORS
- ARIZONA CHAPTER



Amanda McGennis, Senior Vice-President

GREATER PHOENIX CHAMBER OF
COMMERCE



Jay Kaprosy, Vice President - Public Affairs

cc. S. Burr

I. RULE FOCUS AND SOURCE CATEGORY DEVELOPMENT

A. Studies and Report required by ARS § 49-426.08. Developing and publishing the initial studies and report prescribed by ARS § 49-426.08 is prerequisite to rule development.

1. Has ADEQ completed all eleven components of the study required by ARS § 49-426.08.A. (particularly A.5, A.6, A.7) and published the report of all findings as required by ARS § 49-426.08.B.?
2. Is ADEQ relying on the 1995 ENSR report to meet all of the requirements of ARS § 49-426.08?
3. Given the dramatic changes in our state over the past decade, has ADEQ updated any initial findings?
4. How has ADEQ incorporated any studies and findings, and any updates as applicable, into the current rulemaking process?
5. A previous ADEQ HAPs report identified domestic activities, such as wood stoves and swimming pools, as well as motor vehicles and lawn and garden equipment as main sources of air toxics health threats. Will such sources be subject to the rule?

B. Scope of Initial Source Category List. Under the statutory authority for the rule, ADEQ need not attempt to list all source categories subject to the rule at once. Instead, ADEQ "may by rule designate a category of sources that are subject to the state program..." ARS § 49-426.05.A.

1. Industrial sources appear to be the primary target for regulation. Why?
2. Are domestic sources and government-owned sources also being considered for listing?

C. Statutory Requirements for Listing. The statutory requirements for listing source categories are stringent ones. ADEQ must find that HAPs emissions "result in adverse effects to human health or adverse environmental effects." In making this determination, ADEQ must consider:

1. The number of persons likely to be exposed to emissions from sources in the category.
2. Whether the category should be limited to sources with the potential to emit hazardous air pollutants in amounts exceeding the thresholds set forth in § 49-426.06.A.2.
3. Whether based on the criteria set forth in this subsection, the category should be limited to sources located in a particular geographic area.

The statutory criteria for listing a source category also states that the director shall to the maximum extent practicable define source categories so that they cover only those sources for which the finding required by this subsection has been made. ARS § 49-426.05.A.

1. How will ADEQ give due consideration to these statutory requirements?
2. How does the modeling methodology developed by Weston meet these statutory requirements?
3. When will ADEQ provide a proposed methodology for evaluating whether source categories whose SCREEN 3 results fall within the 80%-120% range will be subject to HAPRACT requirements?

D. Conservative Nature of the Modeling Methodology. As noted by numerous commenters at the August 10th meeting, the modeling methodology is quite conservative.

1. Why does the modeling rely on worst case potential impacts (and for some sources apparently ignores operating limitations and permit restrictions on potential emissions) rather than determining whether emissions actually result in adverse effects to human health or adverse environmental effects?
2. How does ADEQ's use of the process area boundary to determine acute and chronic health effects comport with statutory requirements to consider "the number of persons likely to be exposed to emissions from sources in the category" when deciding which source categories will be subject to the rule. See A.R.S. § 49-426.05.A.1.? This is of particular concern for sources that have installed fences, and/or taken other security measures to deter trespassers from accessing areas adjacent to process activities.
3. The statute requires findings based on actual circumstances, not on conservative assumptions selected to fill data gaps. If ADEQ lacks data for some chemicals or sources, it should defer decisions on those chemicals and sources until data is available, rather than developing methodologies to fill gaps with conservative assumptions in order to regulate for the sake of regulating.

E. Use of Risk Management Analysis under ARS § 49-426.06.C. In response to the concern that the modeling is too conservative, ADEQ commenters at the August 10th meeting proffered the suggestion that these sources can always seek to opt out of the state HAPs rule through the development of source-specific risk management analyses. This suggestion would appear to avoid the statutory obligations for listing source categories and shift the burden on sources to examine actual exposure and effects in order to extract themselves from regulation.

1. How is this approach consistent with the statutory requirements?
2. Will ADEQ provide an opportunity to discuss the technical expectations for risk management analyses before a rule is promulgated?
3. When will ADEQ provide an estimate of the number of risk management analyses expected, the time frames for review, and the agency personnel qualifications for review?

F. Harm to Business. ADEQ's current schedule and sequence for releasing a source categories list is likely to create controversy within the public. In the public's eye, any source category on the strawman list might be deemed to cause adverse effects to its neighbors. ADEQ's planned sequence also may cause unnecessary and unreasonable concern about the value of businesses and residential real estate.

1. Why is ADEQ planning to release its strawman list of source categories, which will include the results of simplified and conservative screen modeling for individual sources, without first considering and more formally responding to stakeholders' concerns about health effects and modeling methodologies and without providing sources with the opportunity to correct the information entered into the models to ensure the models better portray their operations?

II. POTENTIAL FOR PERMITTING DELAYS

We are very concerned that the rule will create lengthy permitting delays. There is a finite amount of resources available to ADEQ and local permitting agencies. ADEQ should not promulgate a HAPs rule until it and the county permitting agencies are able to make these decisions promptly and consistently. Otherwise, it is inevitable that some economically and environmentally beneficial projects will fail to move forward due to lengthy permitting delays.

1. What steps will be taken to ensure the new rule will not create permitting delays?
2. Will ADEQ provide an assessment of the staff, expertise, guidance and resources necessary to make prompt and sound decisions on HAPRACT, risk management analyses, modeling, and HAPs modifications?
3. Will ADEQ and the local permitting agencies have the resources necessary to implement the rule at the end of the year?

III. IMPLEMENTATION UNCERTAINTY AND INCONSISTENCY

It is critical that ADEQ and the local permitting agencies implement the rule in a consistent manner to ensure a level playing field for all affected businesses.

1. What measures have been developed to ensure that requirements are consistent among jurisdictions?

IV. IDENTIFICATION OF HAPRACT AND MACT REQUIREMENTS

It is imperative that HAPRACT and MACT requirements or guidance be developed and identified for the source categories that will be subject to the rule before the rule becomes effective.

1. How will HAPRACT and MACT be determined when a source becomes subject to one of the two control requirements?
2. For federally required control technologies such as RACT and BACT, extensive guidance has been developed to guide control technology determinations. Is a central clearinghouse available that a source or the permitting authority can consult to identify what HAPRACT should be for a specific source?
3. EPA has a long history of engaging the affected industries and local permitting agencies in developing RACT and also control techniques guidelines before promulgating rules so that uniform and effective controls can be designed and implemented for all affected sources. Will ADEQ adopt a similar approach here?
4. Will HAPRACT apply to individual HAPs or combined HAPs?

V. MODIFICATIONS

Currently there are no meetings scheduled to discuss modifications, yet there are a number of questions that must be addressed before rule implementation.

1. How will modifications be defined?
2. Will ADEQ adopt a rule that relies on the approach used in the federal New Source Review program or the outdated NSR approach?
3. While HAPRACT can only be applied to equipment that is subject of the modification, how will ADEQ and local permitting agencies make that determination?

VI. STRAWMAN RULEMAKING PROCESS

Additional time is needed to work through each concern about ADEQ's methodologies in a structured, unrushed process. The current schedule is unrealistic. For example, the two weeks provided in September for responding to ADEQ's yet-unreleased list of source categories is insufficient to enable stakeholders to review the list, check the data relied upon by ADEQ, and submit information to ADEQ in time to provide meaningful input.